

# Van Dorn Metrorail Station Kiss & Ride Shuttle Bus Access Improvement Study

## Final Report

Van Dorn Street Metrorail Station  
City of Alexandria, Virginia  
April 2014



Washington Metropolitan Area Transit Authority

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# VAN DORN STREET

Metrorail Station

## Kiss & Ride Shuttle Bus Access Improvement Study

Washington Metropolitan Area Transit Authority  
Office of Real Estate and Station Planning

April 2014



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Appendix C: Detailed Conceptual Cost Estimates

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# Introduction



**Van Dorn Street Metrorail Station  
Kiss & Ride Shuttle Bus Access  
Improvement Study**

## **Section 1**



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## 1.0 INTRODUCTION

The Washington Metropolitan Area Transit Authority (WMATA or “Metro”), in coordination with the City of Alexandria and Fairfax County, initiated the Van Dorn Kiss & Ride and Shuttle Bus Access Improvement Study to identify and develop design improvements to accommodate the current and future shuttle demand in the Kiss & Ride lot and buses using the Bus Loop at the Van Dorn Metrorail Station (“the Station”).

The Station currently has the second highest shuttle activity in the Metrorail system, and this shuttle activity is forecasted to increase by 63 percent by 2040 (*Shuttle Services at Metro Facilities*, 2011). Meanwhile, the City of Alexandria is planning to implement the Van Dorn-Beauregard Bus Rapid Transit line, which will terminate at the Station, and lead to increased bus service. Given the current and forecasted increase in shuttle and bus activity, Metro, Fairfax County, and the City of Alexandria have developed design alternatives that meet the station’s current and future needs. This report describes and provides cost estimates for the design options that increase capacity and improve circulation for both the Kiss & Ride lot and Bus Loop.

This report is organized as follows:

**Section 1** – Introduction, Station Overview, Station Configuration, and Previous Studies

**Section 2** – Existing Transportation Operations and Usage

**Section 3** – Future Station Needs/Key Findings

**Section 4** – Kiss & Ride Lot Alternatives

**Section 5** – Bus Loop Alternative

**Section 6** – Conclusions and Next Steps

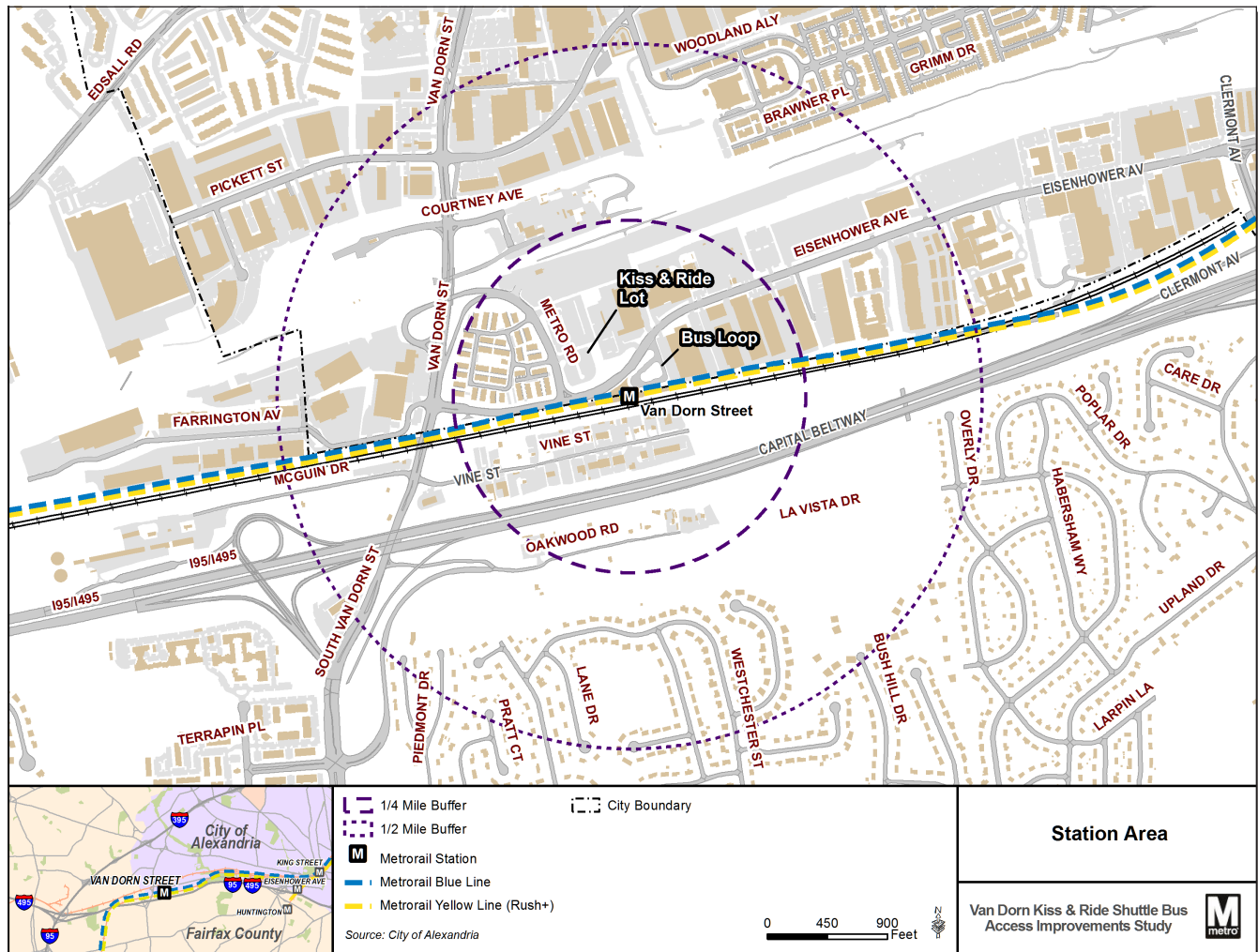
### 1.1 Station Overview

The Station is located on the border of the City of Alexandria and Fairfax County, Virginia, and serves the Metrorail Blue Line and Yellow Line “Rush-Plus” trips. The Station is located on Eisenhower Avenue, east of S. Van Dorn Street, and just north of the Capital Beltway (I-495) (See **Figure 1-1**). The Station opened in 1991 and is located between the King Street Metrorail Station and the Franconia-Springfield Metrorail Station, the western terminus of the Blue Line. In addition to Metrorail, the Station is served by multiple bus services, including DASH (Alexandria Transit Company), Fairfax Connector, and Metrobus, and is a pick-up/drop-off point for multiple private shuttle services.

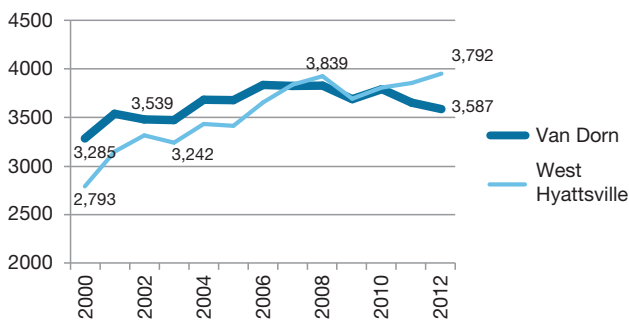
The Station site is situated on both sides of Eisenhower Avenue. The Park & Ride and Kiss & Ride lots are north of Eisenhower Avenue with access from Metro Road. The Bus Loop is south of Eisenhower Avenue (See **Figure 1-1**) with six bays and bus access from Eisenhower Avenue. The Park & Ride is a surface parking lot with 361 all-day parking spaces; and the Kiss & Ride consists of a pick-up/drop-off lane for vehicles and taxis, short-term parking spaces and bike racks and storage lockers. There are two customer access points into the station, one from the Bus Loop and the other from the Kiss & Ride (See **Figure 1-1**).

On an average weekday in 2012, the Station served 3,587 boardings – a nine percent increase from FY 2000 to 2012 (See **Figure 1-2**). West Hyattsville

**Figure 1-1** Station Area



**Figure 1-2** 2000 - 2012 Average Daily Weekday Station Boardings



Source: Metro 2000 - 2012 Station Boardings

Station, which has a similar suburban station environment, is shown alongside Van Dorn Street for comparison purposes.

Compared to the Metrorail system-wide average, the number of daily station boardings at Van Dorn Street Station is low, but typical for an outer suburban station. During the AM peak period (7:00 AM – 9:00 AM), over 80 percent of passenger volume is station entries, indicating the surrounding land uses do not offer significant employment opportunities. According to 2012 faregate data, most passengers entering at Van Dorn Street Station exit at the Farragut West, McPherson Square, or Pentagon stations.

## 1.2 Station Area Configuration

**Figure 1-3** shows the configuration of the station area outside the passenger platform and mezzanine. These include the Bus Loop, Kiss & Ride lot and Park & Ride lot, which are summarized on the next page.

**Figure 1-3** Station Location, Access and Circulation





**Park & Ride lot:** The Park & Ride lot is north of Eisenhower Avenue and the Kiss & Ride lot, east of Metro Road (See **Figure 1-4**). It provides 361 parking spaces, with a utilization rate of 110 percent (due to parking in unmarked spots). The Park & Ride lot typically becomes full by 9:30 AM; some turn over occurs throughout the day, but spaces typically begin to become available in the early afternoon. Vehicle exits are predominately after 4:30 PM.

**Figure 1-4** Park & Ride Lot



Source: Bing Maps (2012)

**Kiss & Ride lot:** The Kiss & Ride lot is located on the north side of Eisenhower Avenue, south of the adjacent Park & Ride lot. It is accessed from Metro Road. The Kiss & Ride lot has several functions including car sharing, handicap parking, pick-up/drop-off of passengers, short-term metered parking, shuttle bus pick-up/drop-off and driver-occupied waiting spaces. Taxis, private shuttles, and private automobiles pick-up, drop-off, and wait for passengers at the Kiss & Ride lot.

The Kiss & Ride lot is segmented by a wide center median (See **Figure 1-5**), with 18 short-term spaces to the west of the median and 34 spaces to the east. Thirty-four short-term parking spaces are available in the Kiss & Ride lot, including one car-sharing (ZipCars) space, eleven 15-minute driver waiting (A) spaces, and two handicapped spaces. These spaces are restricted for use by time of day; Kiss & Ride lot vehicles may use these during the periods 5:00 - 8:30 AM and 3:30 - 7:00 PM and longer-term parking can

occur during the periods 8:30 AM - 3:30 PM and 7:00 PM - 2:00 AM. Use of these spaces is prohibited between 2:00 AM - 5:00 AM.

**Figure 1-5** Kiss & Ride Lot



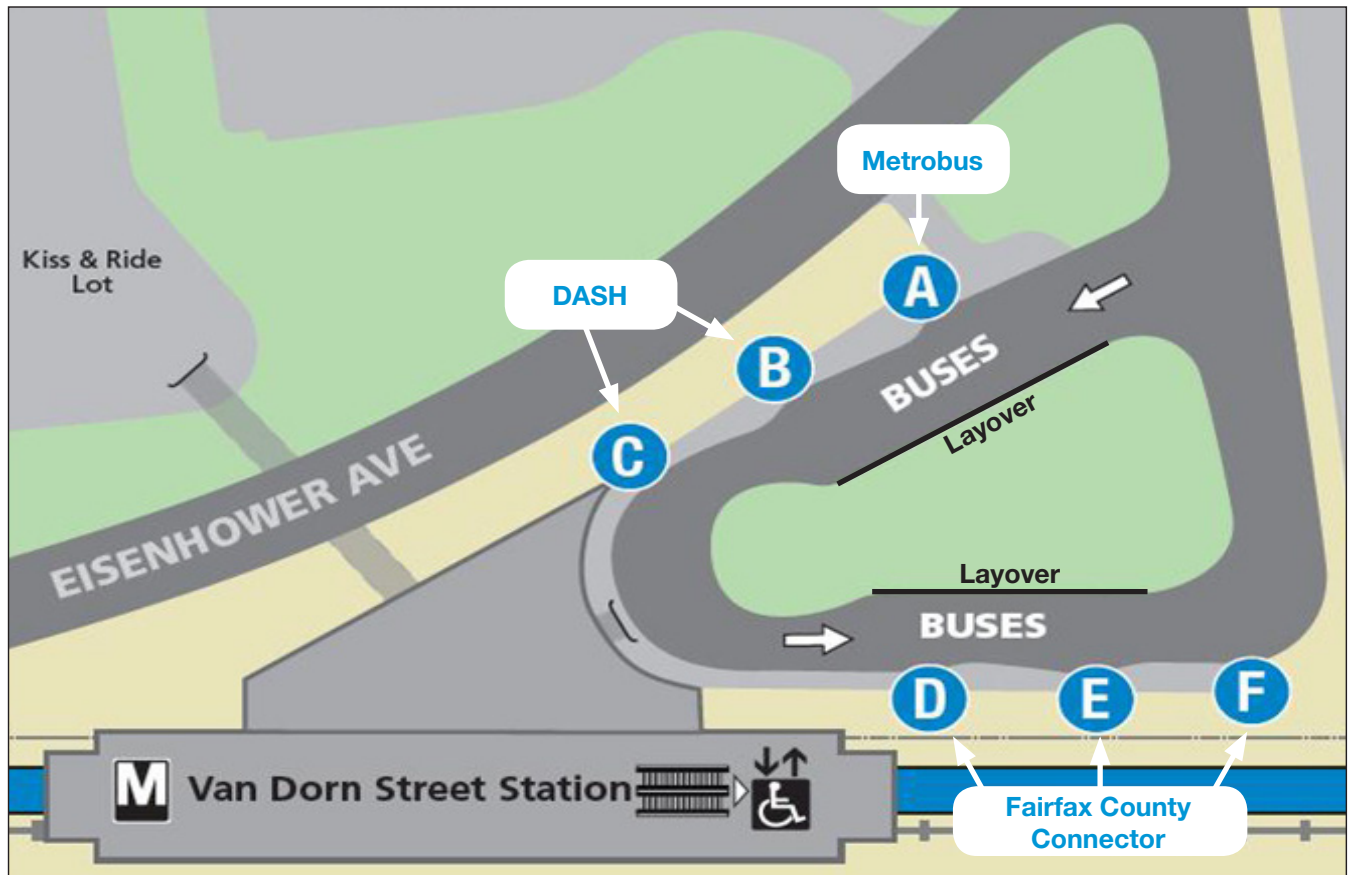
Source: Bing Maps (2012)

**Bus Loop:** The Bus Loop is located east of the Station entrance, south of Eisenhower Avenue, and includes six bus bays and five lay over spaces. It accommodates twelve routes and three operators, Metrobus, DASH, and Fairfax Connector. Shuttles are prohibited from entering the Bus Loop. **Figure 1-6** shows the Bus Loop configuration, routes, and bay assignments.



Figure 1-6 Bus Loop Configuration

Bus Bay	Take Route	DESTINATION	Serving	Operator Code
A	25B	BALLSTON-MU	Landmark Mall, Carlin Springs Rd	Metro
	7	HOLMES RUN PKWY	Pickett St	DASH
B	1	SEMINARY PLAZA	Beauregard St, Seminary Rd, Mark Center	DASH
	5	BRADDOCK ROAD	Van Dorn St, King St	DASH
	8	OLD TOWN ALEXANDRIA	Duke St, Washington St	DASH
C	1	EISENHOWER AVE	Eisenhower Ave	DASH
	7	LEE CENTER	Eisenhower Ave, <b>King Street</b>	DASH
D	109	HUNTINGTON	Rose Hill Dr, Telegraph Rd	FC
E	231	FRANCONIA-SPRINGFIELD  #	Franconia Rd, Beulah St	FC
	321	FRANCONIA-SPRINGFIELD  #	Edsall Rd, Springfield Mall	FC
F	232	FRANCONIA-SPRINGFIELD  @	Kingstowne Village Pkwy	FC
	322	FRANCONIA-SPRINGFIELD  @	Van Dorn St, Kingstowne Blvd	FC



Source: WMATA

## 1.3 Previous Studies

### 1.3.1 Metrorail Station Access Alternatives Study

Metro initiated the *Metrorail Station Access Alternatives Study* (July 2012) to study and prioritize recommendations intended to improve access to Metrorail stations across the system. The study used the Van Dorn Station as a case study to illustrate how a shuttle management policy could be implemented in terms of station design. The study recommended that large shuttles utilize one of the existing bus bays instead of using the Kiss & Ride lot or stopping along Eisenhower Avenue. The study also noted (p. 60) that “WMATA would review the utilization of the Station’s bus bays and determine which have excess capacity that could be used by private operators, and those operators would be required to tailor their schedules to accommodate published bus schedules”.

For smaller shuttles the study recommended designating a shuttle loading zone(s) within the Kiss & Ride lot (See **Figure 1-7**). During the AM and PM peak periods the central, curved portions of the Kiss & Ride loading areas would be reserved for privately-owned vehicles (shown as green-hatch) and shuttles (farther away from entrance, shown as yellow hatch). The shuttles would be assigned a bay.

### 1.3.2 Shuttle Services at Metro Facilities

Metro initiated the *Shuttle Services at Metro Facilities Study* (2011) to update its station access policies and procedures to better address the current and future demand at station facilities. The study presented a summary of existing shuttle services, shuttle impact on station-area operations, access management lessons learned from other U.S. transit agencies, an estimate of future shuttle demand, and a series of facility design, demand management, permitting, and enforcement recommendations.

Metro currently manages shuttle access through its bus bay prioritization policy. Shuttles are authorized to access a designated bus bay provided that the shuttle operator has been approved by the Office

of Bus Planning staff. According to the *Shuttle Services at Metro Facilities Study*, Metro currently requires shuttle operators to request authorization to serve Metrorail stations only if the service provider wishes to serve station bus bays. Metro’s Policy/Instruction #3.1/1 assigns last priority to shuttles, after Metrobus, Compact jurisdiction services, and other public agencies. In addition, the policy defines the procedures for non-Metro operators (i.e. shuttle services) to request use of station bus bays. Shuttles are not authorized to use station bus bays if the shuttle operator has not entered into a formal license agreement with Metro for bus bay use.

To best address and accommodate systemwide shuttle growth, the study recommends reconfiguring station facilities and/or implementing a demand management program through policies, programs, and local partnerships to help reduce the number of shuttles accessing a station.

**Figure 1-7** Shuttle Design Recommendation



Source: Metrorail Station Access Alternatives Study (2012)



The background image shows a transit station area. On the left, there are trees with green and yellowing leaves. A concrete wall runs across the middle ground. In the foreground, there's a sidewalk with a black metal fence and some green bushes. Several vehicles are visible: a white van, a silver car, a white minivan, a blue and white bus, and a black SUV with 'BMW of Alexan' visible. A person is walking on the sidewalk. The sky is overcast.

# Existing Transportation Operations and Usage

**Van Dorn Metrorail Station  
Kiss & Ride Shuttle Bus  
Access Improvement Study**

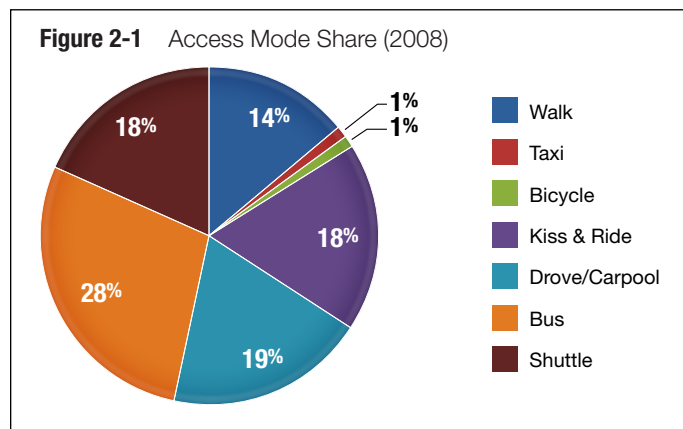
## **Section 2**

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## 2.0 EXISTING TRANSPORTATION OPERATIONS AND USAGE

This section of the report summarizes the existing transportation operations including bus operations by mode, including bus operations pedestrian and bicycle facilities and access, private shuttle activity, and automobile access and usage are summarized below.

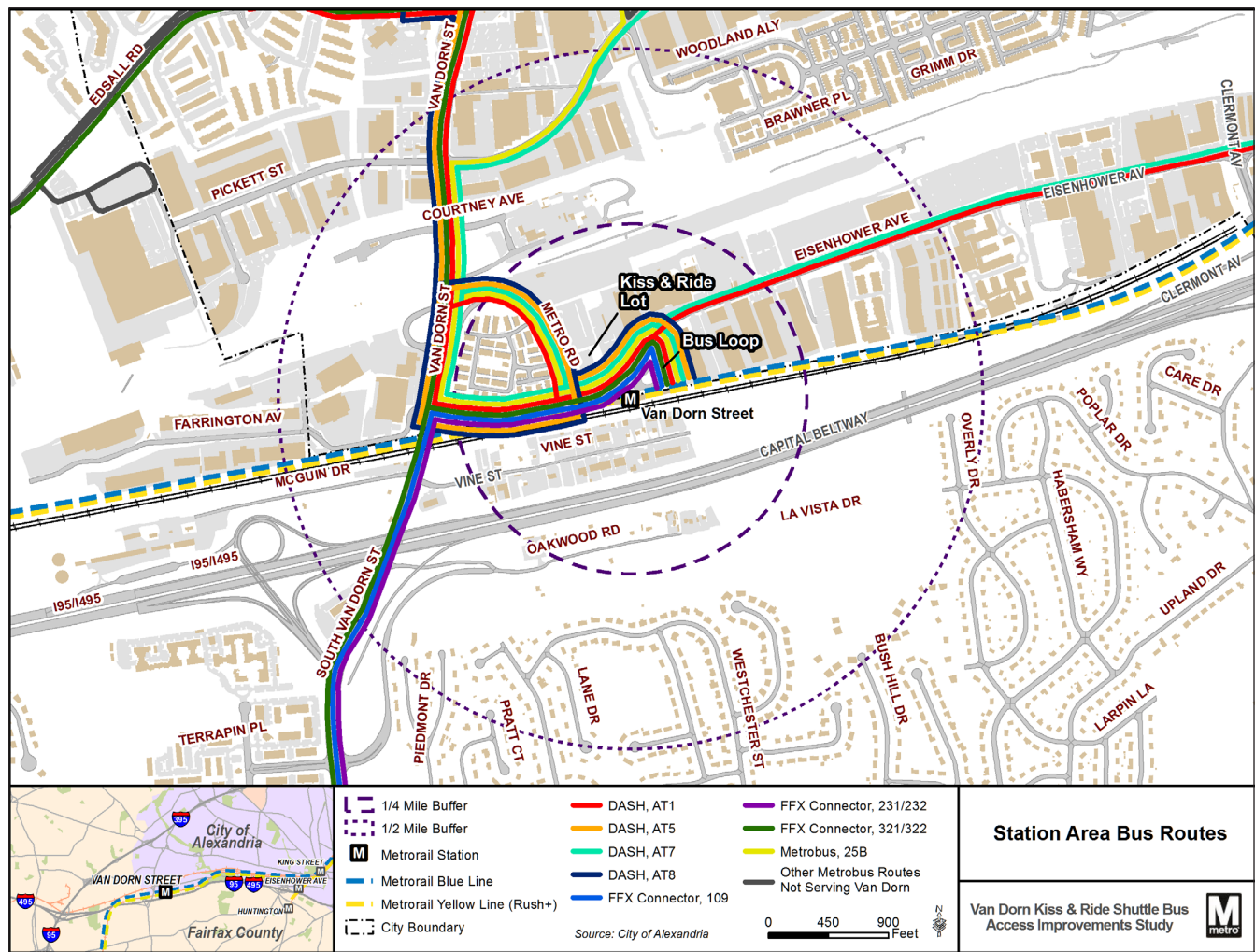
According to the 2008 Metro Passenger Survey, the highest percentage of passengers accessing the Station was by bus (28 percent); 18 percent of passengers accessed the Station via the Kiss & Ride lot; 19 percent either drove or carpooled; 18 percent accessed the Station via a shuttle; 14 percent walked to the Station; and one percent biked. **Figure 2-1** summarizes the access mode share.



### 2.1 Bus

One Metrobus route, four DASH routes and five Fairfax Connector routes serve the Station. The routes are shown in **Figure 2-2** and described in more detail in **Appendix B**. The Station includes an off-street Bus Loop with six bus bays as well as additional layover spaces. Because the Office of Bus Planning has determined there is no unused capacity in the bus bays, the bays cannot accommodate shuttle service in the current configuration.



**Figure 2-2** Station Area Bus Routes


## 2.2 Automobiles: Passenger Vehicles and Taxis

This section summarizes the passenger vehicle and taxi movements in and around the Kiss and Ride lot, while Section 3.0 describes the observed conflict movements in the Kiss & Ride facility and adjacent to the Eisenhower Avenue shuttle stop.

To analyze the existing transportation operations, the project used Metro 2008 survey data, Metro 2012 bus schedule information, and video capture data. Cameras were placed at seven locations to capture vehicular and pedestrian activity. Data were recorded for two six hour sessions, including both the morning and evening peak periods.

### 2.2.1 Passenger Vehicles

According to the 2008 Metrorail Survey, over one-third of passengers accessed the Station in a private automobile. Automobiles accessing the station either enter the Kiss & Ride lot to drop-off or pick-up passengers or park in the Park & Ride lot. Some passenger vehicles were also observed picking up and dropping-off passengers along Eisenhower Avenue, near the shuttle stop.

Cars access the Kiss & Ride lot from Metro Road via Eisenhower Avenue, and either park in a short-term (15 minute) space or line up along the outer lane near the bike lockers (See **Figure 2-3**). The spaces immediately adjacent to Metro Road are the least

**Figure 2-3** Vehicular Movements in Kiss & Ride Lot



Source: City of Alexandria

utilized, while those closer to the Station entrance are typically about 70 percent full in the peak periods. In the AM peak hour, 117 passenger vehicles entered the Kiss & Ride, while in the PM peak hour 212 passenger vehicles entered the Kiss & Ride. For the Park & Ride lot, by 9:00 AM the 361-space Park & Ride lot is completely full.

### 2.2.2 Taxis

In the PM Peak, taxis line up in the Kiss & Ride lot parallel to Eisenhower Avenue. The taxi queue sometimes blocks traffic and restricts circulation. Between 4:00-7:00 PM, 23 taxis entered the Kiss & Ride lot. Taxi activity is significantly higher in the PM period than the AM period.

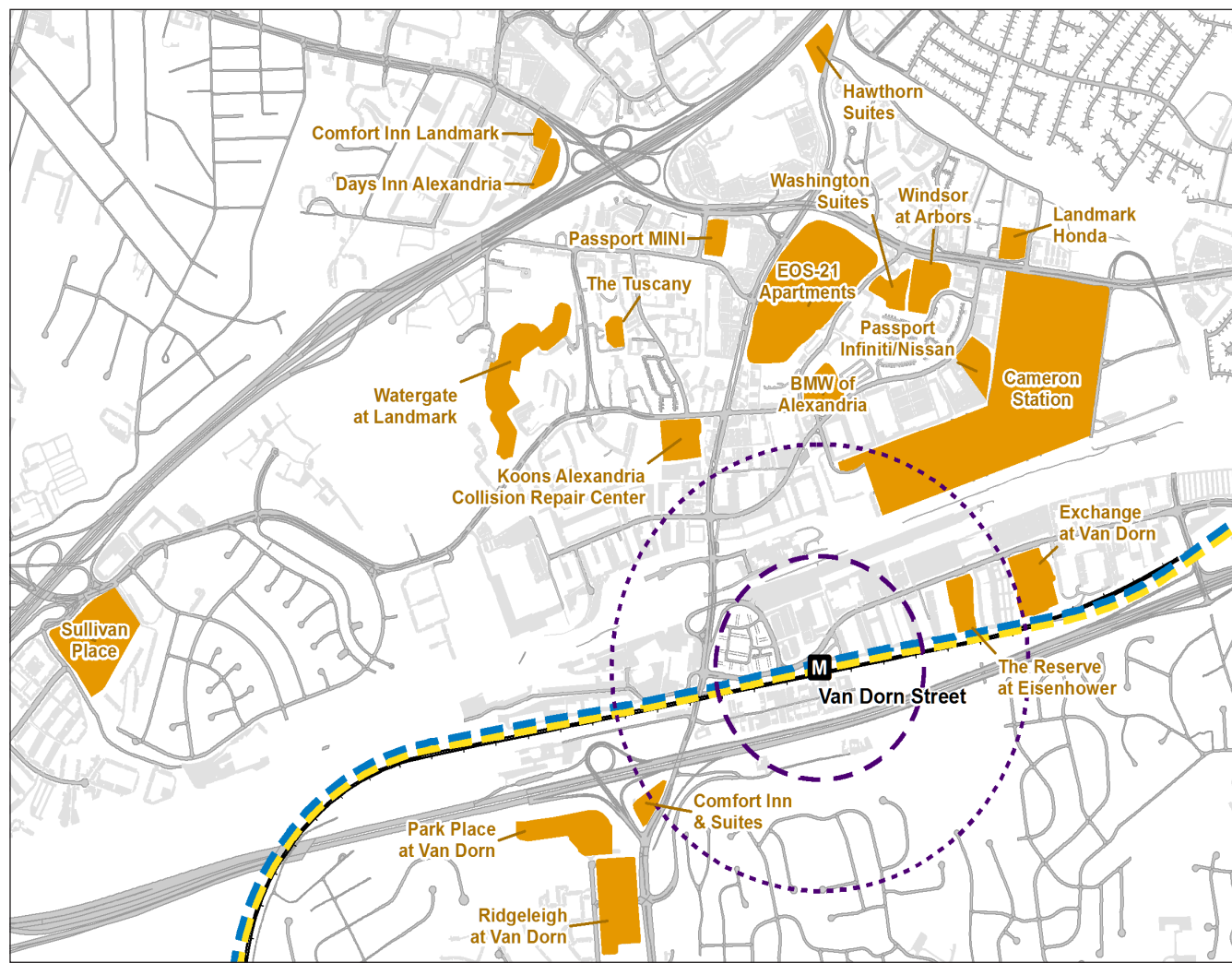


## 2.3 Private Shuttles

As previously mentioned, the Van Dorn Station has the second highest private shuttle activity in the Metrorail system, with about 41 shuttles per hour on an average weekday morning (*Shuttle Services at Metro Facilities*, 2011). Car dealerships, hotels, employers, and apartment buildings and complexes

provide shuttles to the Metrorail station. **Figure 2-4** shows the locations with dedicated shuttle service to the Station. According to the *Shuttle Services at Metro Facilities* (2011), the number of shuttle trips is expected to increase 63 percent by 2040. **Table 2-1** summarizes the study findings.

**Figure 2-4** Dedicated Shuttle Service Locations



Source: City of Alexandria




**Table 2-1** Current and Forecasted Shuttle Demand

Typical Shuttles Per Hour 2010	Trips per Peak Hour 2030	Trips per Peak Hour 2040	Shuttle Trip Growth (2010-2030)	Shuttle Trip Growth (2010-2040)
41	59	67	44%	63%

Source: WMATA, Shuttle Services at Metro Facilities 2011.

Shuttles that serve the Station are informally classified into three size classes: 15 passenger vans; small shuttles, and large shuttles. “Small shuttles” are less than 26-feet in length and are allowed to use the Kiss & Ride lot (See **Table 2-2** and **Figure 2-5**). “Large shuttles” greater than 26-feet are prohibited from entering the Kiss & Ride lot and therefore pick up passengers at the designated space on eastbound Eisenhower Avenue. Shuttles that stop at this location make a U-turn by using the entrance to the Bus Loop. Large shuttles were observed illegally entering the Kiss & Ride in the both the AM and PM peak.

**Table 2-2** Shuttle Size

Shuttle Size	Example Image
15' Passenger Shuttle	
30' Small Shuttle	
40' Large Shuttle	

**Figure 2-5** Shuttle Activity in Kiss & Ride Lot



During the AM peak, 70 percent of shuttles use the Kiss & Ride lot, while 30 percent stop along Eisenhower Avenue. In the PM peak, 82 percent of shuttles use the Kiss & Ride lot while 18 percent pick up passengers along Eisenhower Avenue. **Table 2-3** summarizes the frequency and size of the shuttles, while **Figure 2-6** summarizes the shuttle movements by vehicle size.

**Table 2-3** Shuttle Operator Summary

Shuttle Provider	Locality	Trips Observed		Vehicle Used	Distance to Destination
		AM Peak (6:30-9:00 am)	PM Peak (3:30-6:00 pm)		
Apartment Complexes					
Ridgeleigh/The Exchange	Fairfax County	4	2	Small Shuttle	1.1
Watergate at Landmark	City of Alexandria	6	5	Small Shuttle	1.8
Sullivan Place	City of Alexandria	4	5	Large Shuttle	2.7
Park Place/Tuscany	Fairfax County	5	5	Small Shuttle	1.4
The Isabella	City of Alexandria	3	5	Small Shuttle	1.8
Cameron Station*	City of Alexandria	5	4	Large Shuttle	2.7
EOS Twenty One*	City of Alexandria	4	3	Large Shuttle	1.4
International Limo	City of Alexandria	6	1	Small Shuttle	1.5
Hotels					
Days Inn/Comfort Inn	City of Alexandria	5	0	Van	2.2
Comfort Inn	Fairfax County	6	3	Van	2.0
Washington Suites Alexandria	City of Alexandria	6	5	Van	1.5
Hawthorne Suites by Wyndham	City of Alexandria	6	3	Van	1.8
Car Dealership**					
Passport	City of Alexandria	1	2	Small Shuttle	1.4
Mercedes Benz	City of Alexandria	0	1	Van	1.4
Landmark Honda	City of Alexandria	1	2	Van	1.7
BMW of Alexandria	City of Alexandria	1	4	Van	1.1
Koons Alexandria	City of Alexandria	0	1	Small Shuttle	1.0
Jerry's Ford	City of Alexandria	0	1	Van	3.1
Other Unknown					
Other/unknown	City of Alexandria	4	0	Small Shuttle	n/a

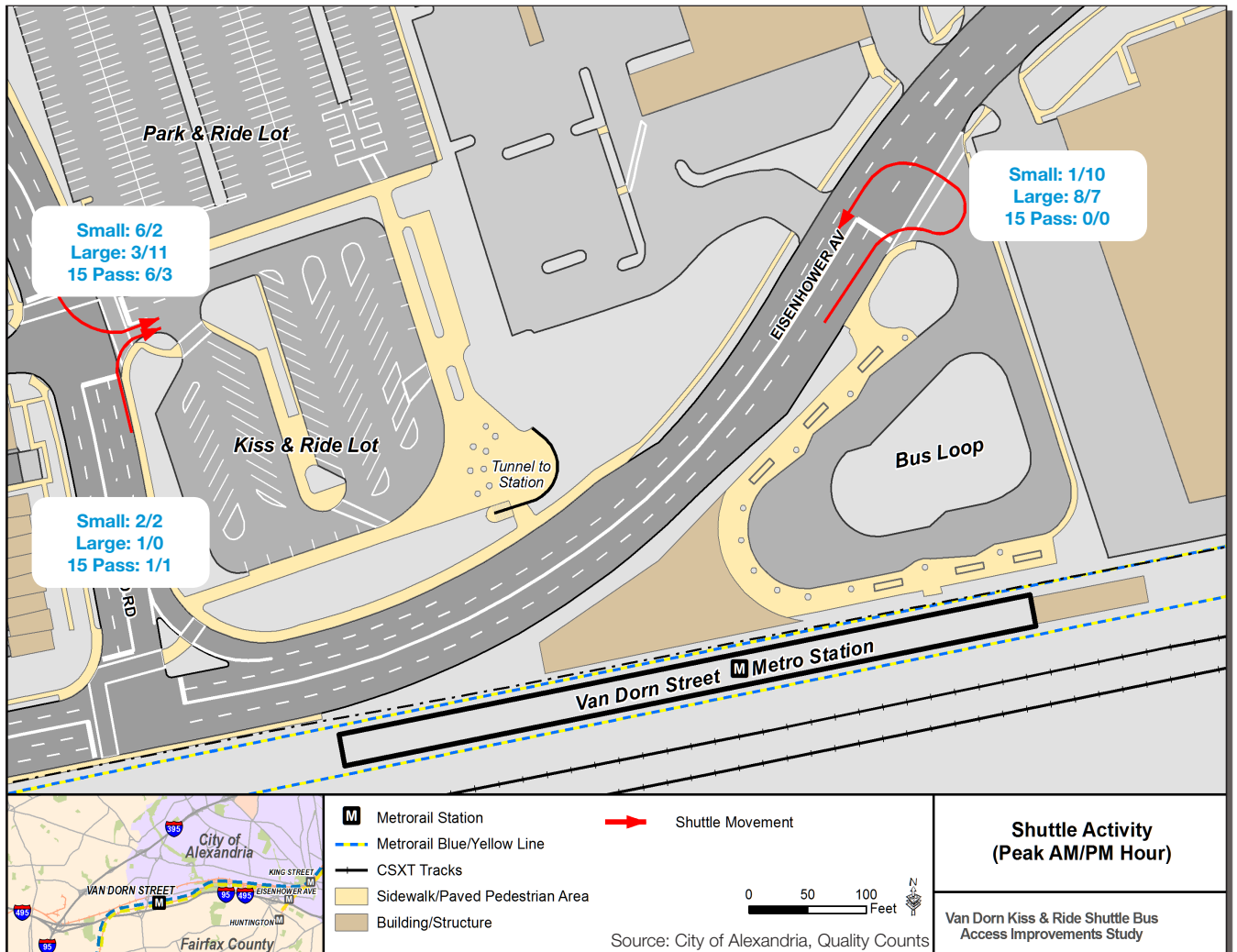
\*Observed dropping off passengers along Eisenhower Avenue.

\*\*Unconfirmed.

Source: Field Observations, GIS



**Figure 2-6** Shuttle Activity (Peak AM/PM Hour)



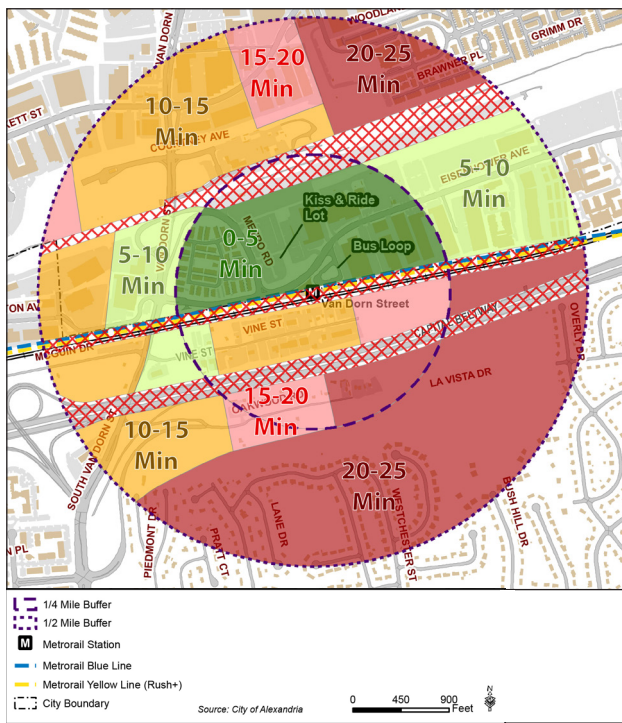
## 2.4 Walk and Bike

Pedestrian connections are poor beyond the immediate station area; sidewalks are intermittent and narrow, block sizes are large, and CSXT tracks and I-495 impede access to the station. To better illustrate this point, the approximate time it would take to walk from various locations near the station was calculated and are shown in **Figure 2-7**. Despite the area's pedestrian facilities, about 350 people (14 percent) walked to the Station in the AM peak period. **Figure 2-8** and **Figure 2-9** show pedestrian activity and conditions.

**Figure 2-8** Pedestrians Entering Station

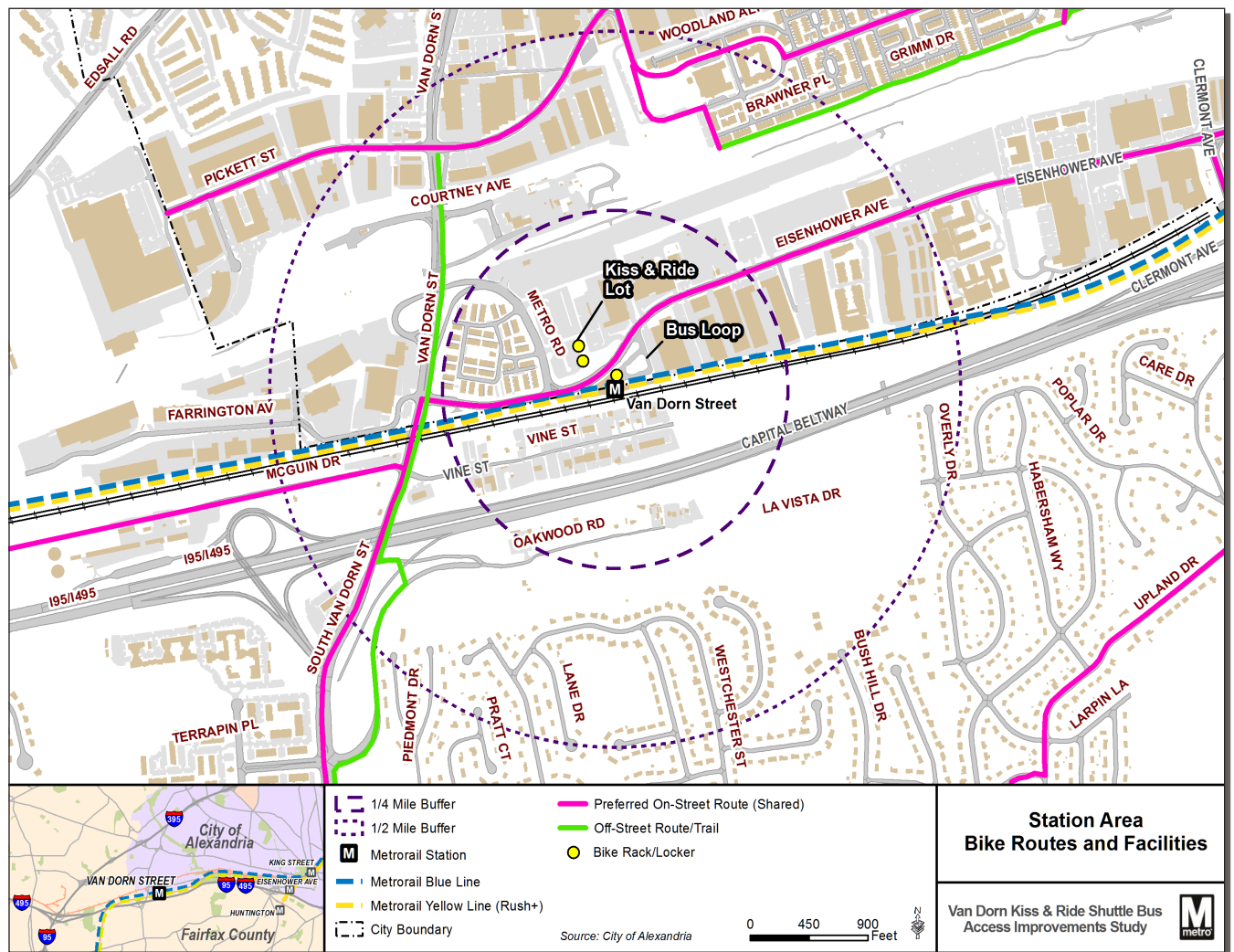


**Figure 2-7** Walkability



**Figure 2-9** Pedestrian Conditions Looking Westbound on Eisenhower Avenue



**Figure 2-10** Bicycle Facilities


Only one percent of passengers reported accessing the Station by biking. Overall, there are very few bike lanes or designated bike routes surrounding the station, and on-street trails are poorly connected to other trails. High traffic volumes on surrounding roads create an unsafe biking environment. As shown in **Figure 2-10**, the City and County designate portions of Eisenhower Avenue and South Van Dorn as preferred on-street bike routes, although there are no marked bicycle lanes. Fairfax County is currently developing a Bicycle Master Plan which designates additional bike routes near the station.

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# **Future Station Needs and Key Findings**

**Van Dorn Metrorail Station  
Kiss & Ride Shuttle Bus  
Access Improvement Study**

## **Section 3**



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## 3.0

# FUTURE STATION NEEDS AND KEY FINDINGS

The project team conducted site visits on October 23, 2012, from 4:00-6:30 PM and on October 24, 2012, from 6:30-9:00 AM to observe vehicular and pedestrian movements in the Kiss & Ride lot and Bus Loop during the afternoon and morning peak periods, respectively. Observations were made regarding taxi and private vehicle activity, pedestrian and bicyclist activity, shuttle bus activity both in the Kiss & Ride lot and on-street, and transit bus operations. Key observations are described below, and are addressed by the proposed designs described in **Section 4.0** and **5.0**.

## 3.1

# Kiss & Ride Lot

### 3.1.1

## Taxis & Passenger Vehicles

- Taxis use the Kiss & Ride lot as a staging area during the evening peak period.
- Taxis line up along the outer lane to wait for passengers, which can block through traffic.
- Parking meters are not well-utilized, as there were many vacant metered spaces. A few day parkers, particularly handicapped parkers, used short-term pick-up/drop-off spaces rather than the metered spaces.
- Passenger vehicles were observed waiting to pick up transit riders along the sidewalk, parallel to the bike lockers.
- Taxis are generally plentiful, with more taxis available in the evening peak period than in the morning peak period. In the evening, there are long taxi queues.
- Long queues of vehicles were observed exiting the station, turning southbound onto Metro Road.
- The design options should provide adequate area for taxi waiting and pick up and drop off areas and improve the queue for cars exiting the station.

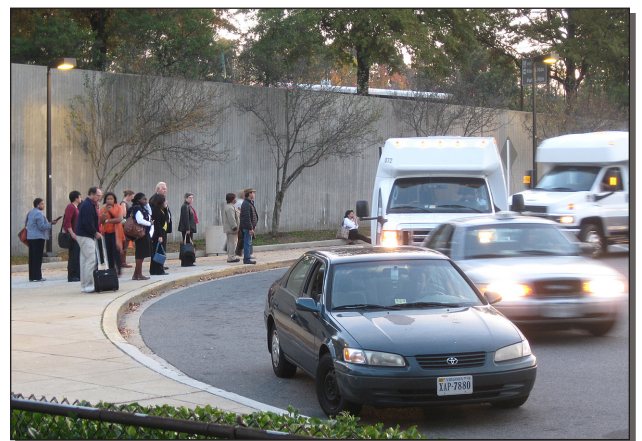
### 3.1.2

## Shuttles

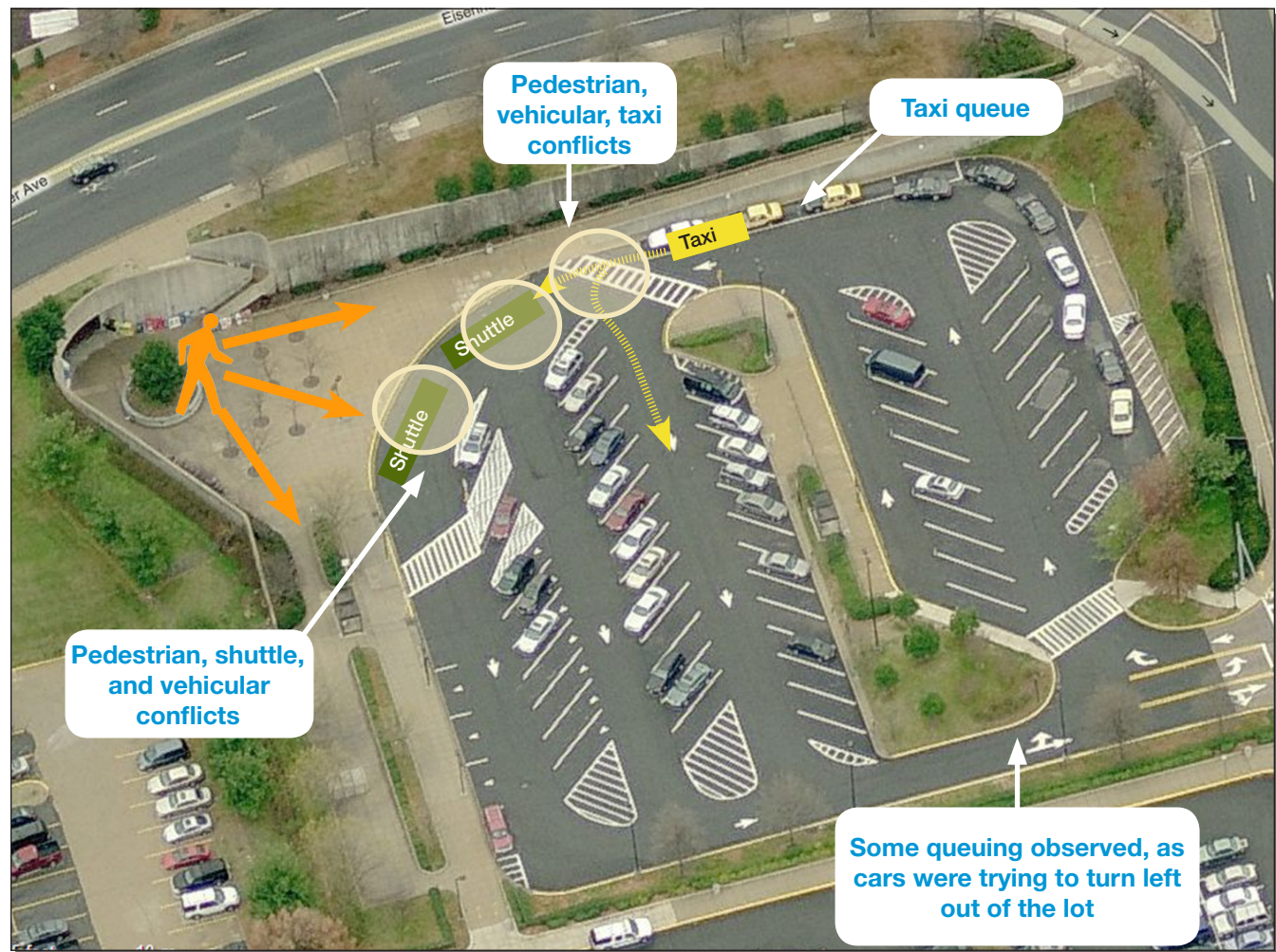
- While 26-foot shuttles are the largest allowed in the Kiss & Ride lot, some larger shuttles have been observed entering.

- Shuttles use the Kiss & Ride lot for layovers and staging in the evening peak period (See **Figure 3-1**). Staging takes place in the curbside spaces near the station entrance, in the diagonal parking spaces, and in the western half of the Kiss & Ride across the pedestrian island.
- Shuttles sometimes pick up passengers in the western half of the Kiss & Ride lot, away from the station entrance. Passengers wait on the pedestrian island to board these shuttles.
- Shuttles use all lanes in the Kiss & Ride lot, particularly to exit after loading.
- Design options should maximize shuttle throughput to accommodate current and future demand.
- No signs are provided for maximum shuttle length.

**Figure 3-1** Kiss & Ride Lot Activity



**Figure 3-2** Station Area



Source: Bing Maps (2012)

### 3.1.3 Pedestrian Conflicts

- Within the Kiss & Ride lot, conflicts were observed among pedestrians, automobiles, and taxis, including at the crosswalks within the lot (see **Figure 3-2**).
- Design options should improve safety and circulation within the Kiss & Ride lot.
- Within the Kiss & Ride lot, private automobiles often wait at the curb rather than in the designated spaces, blocking shuttles, taxis and other cars.



## 3.2 Bus Loop and Eisenhower Avenue Shuttle Stop

### 3.2.1

#### General

- Some buses lay over for short periods in front of the Station entrance (see **Figure 3-3**).
- In the morning peak period, most of the bus activity is alightings, with more boardings during the evening peak period.
- There were no conflicts or issues observed in the Bus Loop.

**Figure 3-3** Bus Loop Activity



### 3.2.2 Shuttles

- Shuttles for two high-rise residential developments use the stop on Eisenhower Avenue.
- Generally, the shuttles on Eisenhower Avenue “load and go” and do not dwell for extended periods.
- Private vehicles picked up and dropped off passengers at the curb and roadway immediately west of the Bus Loop entrance (see **Figure 3-4**); private vehicle use at this location is not permitted.
- Design options should improve the passenger waiting area along Eisenhower Avenue.

**Figure 3-4** Shuttle Stop along Eisenhower Avenue



### 3.2.3

#### Pedestrian Conflicts

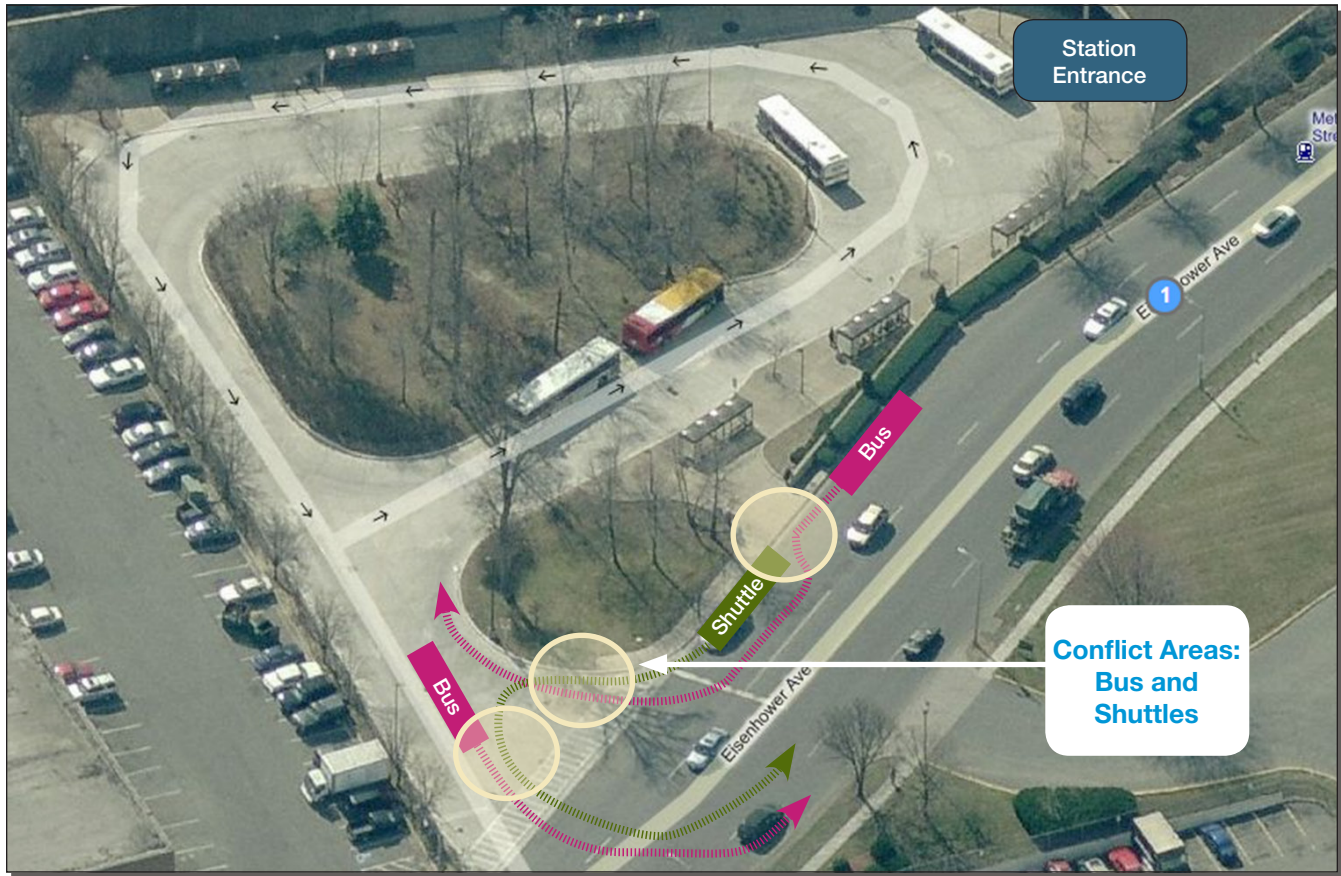
- Conflicts were noted between pedestrians crossing the entrance to the Bus Loop along Eisenhower Avenue and shuttle buses making U-turns (See **Figure 3-5** and **Figure 3-6**).
- Pedestrian wayfinding signage can help direct pedestrians to locations where they can cross safely and legally.
- Additional development along Eisenhower Avenue may increase pedestrian activity near the station.

### 3.2.4

#### Conflicts with Traffic

- Shuttle buses that stop at the designated space on eastbound Eisenhower Avenue make a U-turn using the entrance to the Bus Loop. It is presumed that this U-turn movement is illegal; it does periodically result in minor conflicts with transit buses. If shuttles were strictly prohibited from making this U-turn, they would have to continue at least 0.9 miles to Clermont Avenue or to another location where they could reverse direction.

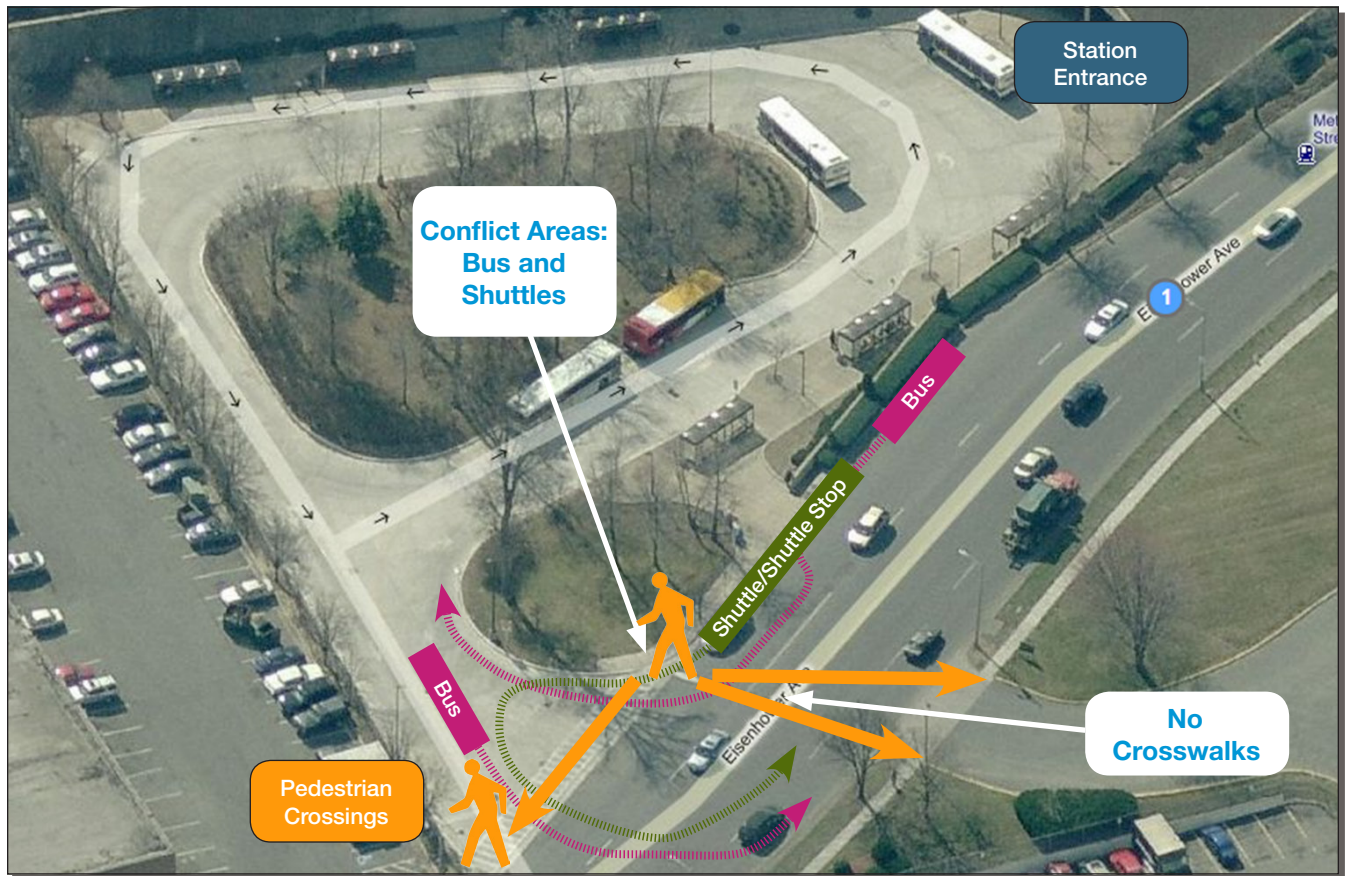
**Figure 3-5** Shuttle Stop along Eisenhower Avenue Observations



Source: Bing Maps (2012)



**Figure 3-6** Shuttle Stop along Eisenhower Avenue Observations



Source: Bing Maps (2012)

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# **Kiss & Ride Lot Alternatives**

**Van Dorn Metrorail Station  
Kiss & Ride Shuttle Bus  
Access Improvement Study**

## **Section 4**



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## 4.0

### KISS & RIDE LOT ALTERNATIVES

This section presents the two options that provide the highest shuttle throughput and improve circulation within the Kiss & Ride lot, while also maintaining adequate parking and taxi waiting area. Several iterations of each design option were developed; previously considered options are provided in **Appendix A**. For each option, key features and order-of-magnitude conceptual cost estimates are provided. Both Options 1 and 2 can accommodate the AM and PM peak hour shuttle volumes (67 shuttles in the AM; 58 shuttles in the PM peak). If shuttle growth continues at a steady rate, both design options should accommodate shuttle growth until 2041 (see **Table 4-1**). **Appendix B** describes how shuttle capacity was calculated.

**Table 4-1** Current and Projected Shuttle Demand

Shuttle Stop Length	Shuttle Layover Location or Length of Queuing Area	Max. Shuttle Buses per Hour: AM	Max Shuttle Buses per Hour: PM	Estimated Year Shuttle Capacity Exceeded: AM Peak	Estimated Year Shuttle Capacity Exceeded: PM Peak
256 feet	105 feet	67	58	2041	2046

Source: Field Observations

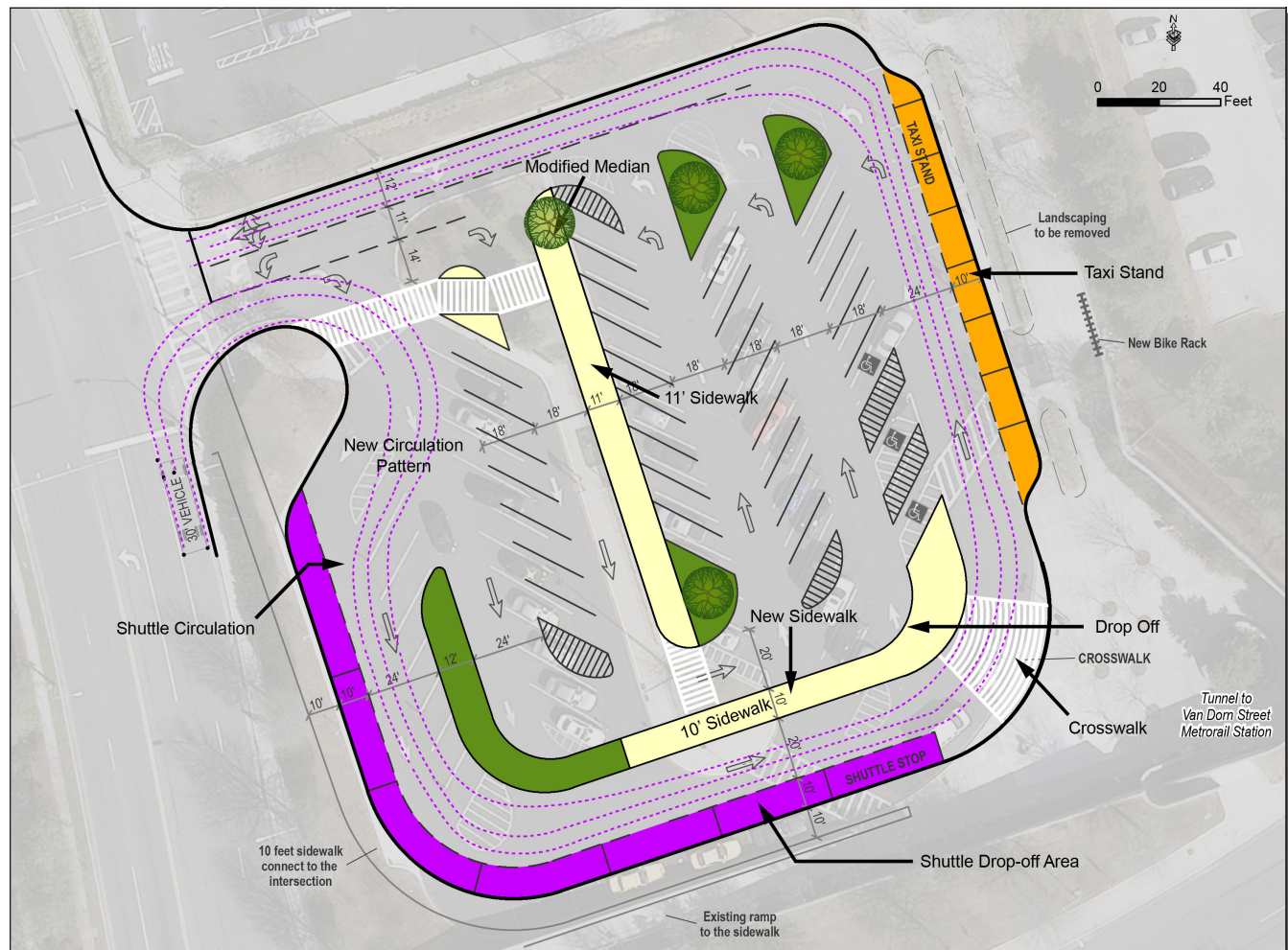


## 4.1

### Kiss & Ride Lot Option 1

Option 1 (see **Figure 4-1**) maximizes the shuttle throughput and optimizes shuttle and vehicular circulation by separating the vehicular and shuttle traffic with the addition of a new median. The existing center median is modified to allow reconfiguration of internal parking spaces and to facilitate improved vehicular circulation. This option designates 120 feet of curb space for a taxi waiting area and 210 feet for shuttles only. The shuttle stop area accommodates six vehicles. Nineteen parking spaces would be removed, for a total of 30 spaces and three handicap parking spaces.

**Figure 4-1** Kiss & Ride Lot Option 1

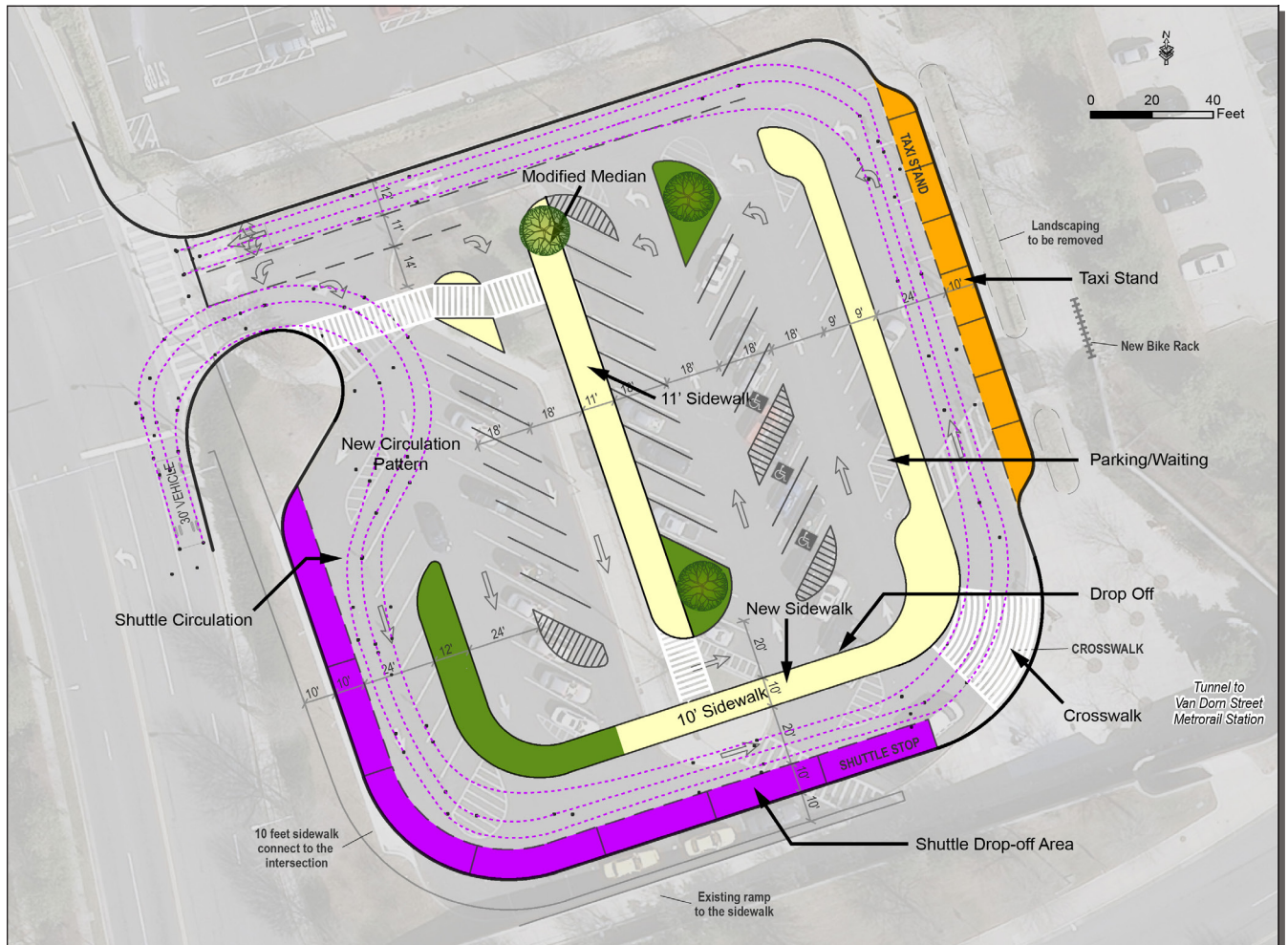


## 4.2 Kiss & Ride Lot Option 2

Option 2 (see **Figure 4-2**) is similar to Option 1 as it maximizes the shuttle throughput and optimizes shuttle and vehicular circulation by separating the vehicular and shuttle traffic with the addition of a new median. The existing center median is modified to allow reconfiguration of internal parking spaces and to facilitate improved vehicular circulation. The option designates 120 feet of curb space for a taxi waiting area and 210 feet as a shuttle only drop off area. The shuttle stop area accommodates six vehicles. Option 2 also designates an additional 100 feet of drop off space for automobiles. This results in elimination of 28 parking spaces (Option 1 removed 19 parking spaces). The Option 2 Kiss & Ride lot therefore

comprises 21 spaces and three handicap parking spaces.

**Figure 4-2** Kiss & Ride Lot Option 2



## 4.3

### Capital Cost Estimate

The cost estimate for Option 1 is \$1,199,989 and Option 2 is \$1,214,376. A summary of capital cost estimates is shown in **Table 4-2**. The cost estimate involves elimination of the current island, additional sidewalks, a new island, and reconfigure internal circulation. The costs provided in **Table 4-2** cover only construction costs based on current bidding price levels and the current projected construction schedule. A three percent annual escalation is assumed. Unit rates have been obtained from historical records and/or discussion with contractors, and reflect current bid costs in the area. **Appendix C** provides more details on the cost estimate.

#### 4.3.1 Assumptions

Capital costs were estimated based on the following general assumptions:

- Construction starts in April 2018 and continues for 8 months.
- The general contract will be awarded to one general contractor and competitively bid to qualified general and main subcontractors.
- No phasing is considered for this cost estimate. However, to ensure continued operations during reconstruction, a phased implementation would be required.
- The general contractor/construction manager will have full access to the site during normal business hours.

**Table 4-2** Shuttle Accommodation Analysis Results

Description		Option 1	Option 2
<i>SITE PREPARATION</i>		153,762	153,762
<i>SITE IMPROVEMENTS</i>		303,598	303,598
<i>SITE MECHANICAL UTILITIES</i>		75,000	75,000
<i>SITE ELECTRICAL UTILITIES</i>		54,000	54,000
* Assume 60% of Estimated Contract Award is labor; 25% of labor is premium time and is paid at time and a half			
		43,976.97	44,504.21
Phasing Requirements		assume not required	assume not required
<i>SITE WORK COST</i>		630,337	637,894
Contingency	20%	126,067	127,579
<i>SITEWORK COST INCLUDING CONTINGENCIES</i>		756,404	765,472
General Conditions and Project Requirements	18.0%	136,153	137,785
Bond and Insurance	2.0%	17,851	18,065
Permit	0.05	assume by owner	assume by owner
Overhead and Profit	14.0%	124,958	126,456
<i>SITEWORK COST BEFORE ESCALATION</i>		1,035,366	1,047,779
Escalation - (assume mid-point of construction 3Q2018)	15.9%	164,623	166,597
<b>RECOMMENDED BUDGET</b>		<b>1,199,989</b>	<b>1,214,376</b>



- Estimates do not include:
  - Hazardous material handling
  - Design, testing, inspection, or construction management fees
  - Assessments, taxes, finance legal and development charges
  - Environmental impact mitigation
  - Builder's risk, project wrap-up and other insurance
  - Land and easement acquisition
  - Cost escalation beyond mid-point of construction (3rd Quarter, 2018)

The following considerations also relate to the cost estimating methodology:

- The estimates include construction and soft costs calculated at current bidding price level (reflecting the current projected construction schedule) with a separate allowance for cost escalation.
- Cost escalation is included to the mid-point of the construction schedule. Costs associated with additional escalation required for future start date are included as a below the line markup.
- Unit rates have been obtained from historical records and/or discussion with contractors. The unit rates reflect current bid costs in the area.
- Pricing assumes competitive bidding for every portion of the construction work. Experience and research indicates that fewer bidders may result in higher bids; conversely an increased number of bidders may result in more competitive bids.

#### **4.3.2**

### **Design Considerations**

#### **Shuttle Stop Area**

Both Options 1 and 2 show designated shuttle spaces along the southern curb of the Kiss & Ride lot. Although not shown, sawtooth bays could be implemented for a comparable cost. This would allow assignment of shuttles by bay. Sawtooth bays would require a wider cross section for the shuttle stop area; this would require moving the median to the north which would result in fewer parking spaces. To provide maximum flexibility, bays would be designed for the largest shuttle allowed, a 30-foot vehicle. Sawtooth bays would limit operating flexibility as vehicle lengths and the number of operators may change periodically. These conceptual design options do not result in an appreciable change in the amount of impervious surface; refinements in later phases of design would confirm actual areas and amounts.

#### **Operations**

A 30-foot design vehicle was used for facility design. This is the maximum length of vehicle that can turn into the facility without encroaching into exit lanes. Signage should be implemented to advise this length restriction. Effective operation may require periodic monitoring and enforcement of circulation, parking and waiting regulations.

#### **Implementation**

Capital costs were developed for implementation of the entire project. Phasing was not assumed. However, to maintain operations at the Kiss & Ride lot during implementation, a phased approach would have to be developed. The specific approach and cost impacts of phased implementation should be developed as a subsequent step after selection of a preferred option. Option 1 and 2 are complementary; the shuttle stop areas and shared shuttle/taxi lane are the same for both. While neither option would preclude modification to obtain the other design; it would be more efficient to move from Option 1 to Option 2.

## Larger Vehicles

As noted earlier, design options are based on 30-foot shuttles. However, the Kiss & Ride could readily accommodate larger shuttles of 35 to 40 feet provided that modifications be made to the Kiss & Ride exit lanes. With the current design, these longer shuttles would encroach into the Kiss & Ride left-turn lane upon entry to the facility. To avoid this encroachment, either the exit could be reduced from two to one lane which may increase the queue for exiting vehicles or the stop bar for the left-turn lane could be moved farther to the east. Shuttles would stop along the curb lane as described for Options 1 and 2. A total linear distance of approximately 250 feet along the curb is sufficient to accommodate up to six larger shuttles. Shuttles would operate on a FIFO (first in/first out) basis and the design allows recirculation without exiting the facility. Specific stop locations by shuttle size or provider are not assumed.



# Bus Loop Alternative

Van Dorn Metrorail Station  
Kiss & Ride Shuttle Bus  
Access Improvement Study

## Section 5



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## 5.0 BUS LOOP ALTERNATIVE

### 5.1 Bus Loop Option

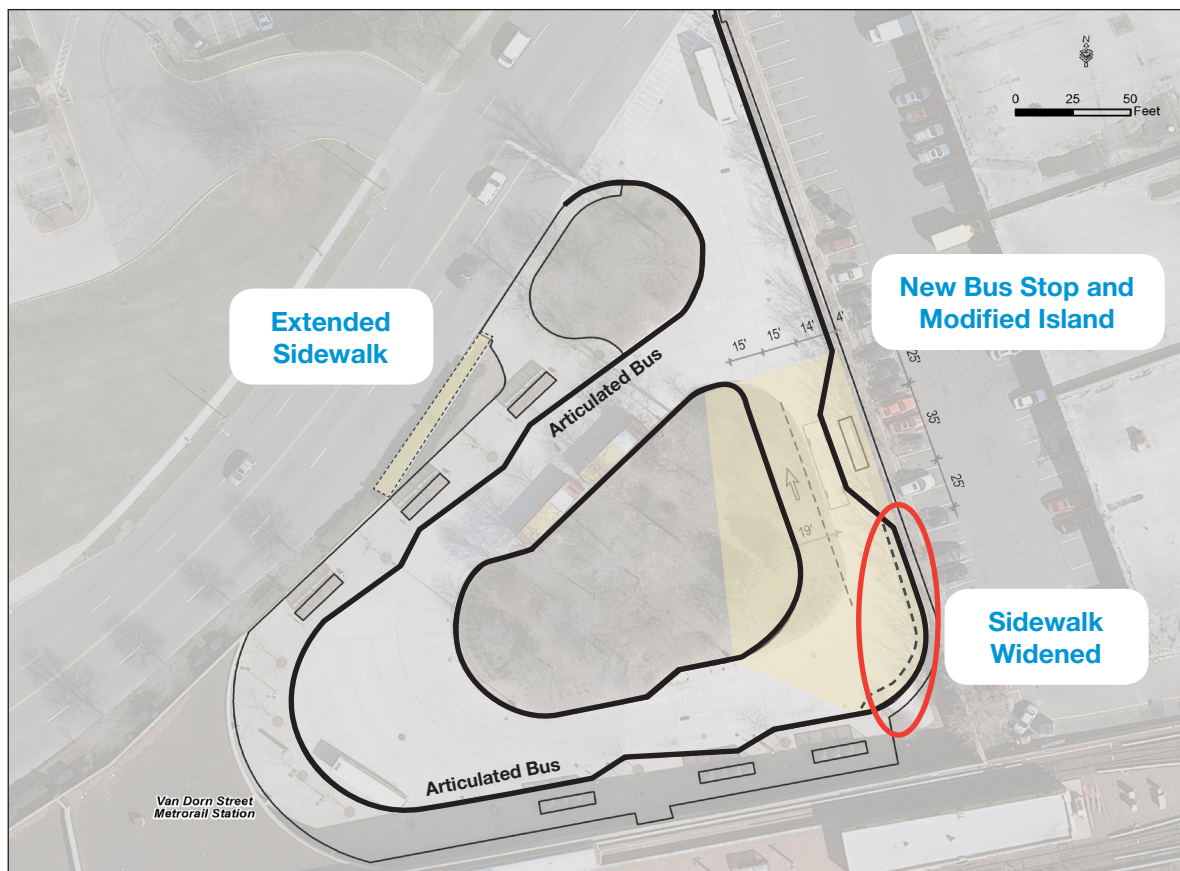
Although the Bus Loop currently functions well, in the future, the Bus Loop needs to accommodate one new revenue bay and one new layover space for a 60-foot articulated bus (see **Figure 5-1**). Two stop locations for articulated buses are indicated in the figure. A new bus stop on the east portion of the Bus Loop would require that the current island be modified and that the sidewalk be widened.

The new bus stop on the east side of the Bus Loop could accommodate an articulated bus by extending the bus stop area; however, this may impact maneuverability/access from last bay along the south

portion of the Loop. Extending the bus stop area to the north to provide more space for an articulated bus is possible; however, this could lead to periodic conflicts between buses exiting and entering the Bus Loop.

To benefit shuttle passengers, an extended sidewalk is proposed along Eisenhower Avenue. This would increase shuttle capacity and provide more space for boarding and alighting.

**Figure 5-1** Bus Loop Option



Source: Bing Maps (2012)

## 5.2

### Cost Estimate

The cost estimate for modifications to the Bus Loop is \$409,302 and the cost for the extended sidewalk is \$74,256. A summary of capital cost estimates is shown in **Table 5-1**. The cost estimate involves site preparation and modifications to the island and internal bus loop sidewalk, and an extension to the sidewalk along Eisenhower Avenue to accommodate shuttle drop offs along Eisenhower Avenue. The costs provided in **Table 5-1** cover only construction costs, and are based on current bidding price levels and the current projected construction schedule. A three

percent annual escalation is assumed. Unit rates have been obtained from historical records and/or discussion with contractors, and reflect current bid costs in the area. **Appendix C** provides more details on the cost estimate.

#### 5.2.1 Assumptions

The assumptions and exclusions described in **Section 4.3** for the Kiss & Ride lot apply to capital cost estimates for the Bus Loop.

**Table 5-1** Overall Summary Comparison - Order of Magnitude Costs

Description		Option 1
SITE PREPARATION		44,220
SITE IMPROVEMENTS		97,967
SITE MECHANICAL UTILITIES		30,000
SITE ELECTRICAL UTILITIES		15,000
* Assume 60% of Estimated Contract Award is labor; 25% of labor is premium time and is paid at time and a half		
		14,039.00
Phasing Requirements		assume not required
SITE WORK COST		201,226
Contingency	20%	40,245
SITEWORK COST INCLUDING CONTINGENCIES		241,471
General Conditions and Project Requirements	25.0%	60,368
Bond and Insurance	2.0%	6,037
Permit	0.0%	assume by owner
Overhead and Profit	15.0%	45,276
SITEWORK COST BEFORE ESCALATION		353,151
Escalation - (assume mid-point of construction 3Q2018)	15.9%	56,151
<b>RECOMMENDED BUDGET</b>		<b>409,302</b>
SIDEWALK ALONG EISENHOWER AVE (Included in base estimate)		
Demo existing sidewalk (includes markup)		12,505
New sidewalk (includes markup)		61,751
<b>TOTAL COST - SIDEWALK ALONG EISENHOWER AVE</b>		<b>74,256</b>



# Conclusions and Next Steps

Van Dorn Metrorail Station  
Kiss & Ride Shuttle Bus  
Access Improvement Study

## Section 6

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## 6.0

### CONCLUSIONS AND NEXT STEPS

All design options will improve circulation and increase capacity in both the Kiss & Ride lot and Bus Loop. The Kiss & Ride lot options differ in the number of parking spaces provided, configuration, and potential impact to utilities. Both Kiss & Ride options could accommodate shuttles up to 30 feet in length and both would provide the same amount of shuttle throughput and pedestrian and bicycle accommodations. These differences do not lead to appreciable variation in capital costs and anticipated implementation activities, but could affect parking revenues in the future. The next phase of project development would involve selection of a preferred option, environmental analysis and detailed engineering. Complementary improvements include signage for shuttles advising size restrictions, circulation patterns and stop areas, and also wayfinding for pedestrians.

For the long term, Kiss & Ride facility modifications could be made to accommodate larger shuttles of 35 to 40 feet. With the current design, shuttles longer than 30 feet would encroach into the exit lane upon entering the Kiss & Ride. To assure unencumbered entry for larger shuttles into the Kiss & Ride, the exit could be reduced from two to one lane or the stop bar from the left-turn lane could be moved farther to the east. Sufficient curb space exists for up to six larger shuttles to queue. As with the current design, shuttles would operate on a FIFO (first in/first out) basis and recirculation would be possible.

Following this phase of work, Metro and Fairfax County and City of Alexandria are expected to conduct required environmental permitting and refine design for the selected option. Project funding sources should be explicitly defined and programmed. Coordination with key stakeholders, including owners of adjacent property, and County officials should continue throughout the process.



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# Van Dorn Metrorail Station Kiss & Ride Shuttle Bus Access Improvement Study

## Final Report Appendices

Van Dorn Street Metrorail Station  
City of Alexandria, Virginia  
April 2014



Washington Metropolitan Area Transit Authority

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# **Appendix A**

## **Previously Considered Design Options**

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# Van Dorn Metrorail Station Kiss & Ride and Bus Access Improvement Study:

Design Improvement Options Technical Memorandum



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## 1.0 Introduction

This technical memorandum summarizes the design strategies to improve the Van Dorn Street Metrorail (“the Station”) Kiss & Ride and Bus Loop. This memorandum is a component of the Van Dorn Kiss & Ride and Shuttle Bus Access Improvement Study being conducted by the Washington Metropolitan Area Transit Authority (WMATA) and will support subsequent study tasks. WMATA has initiated the study, in coordination with the City of Alexandria and Fairfax County, to determine improvements to accommodate short- and long- term demands for shuttles and buses.

The Station currently has the second highest shuttle activity in the Metrorail system, and this shuttle activity is expected to increase by 63 percent by 2014 (*Shuttle Services at Metro Facilities*, 2011). Meanwhile, the City of Alexandria is planning to implement the Van Dorn-Beauregard BRT, which will terminate at the Station, and lead to increased bus service. This additional space must accommodate a 60-foot articulated bus. To meet this demand, an additional revenue bay and lay over space are needed.

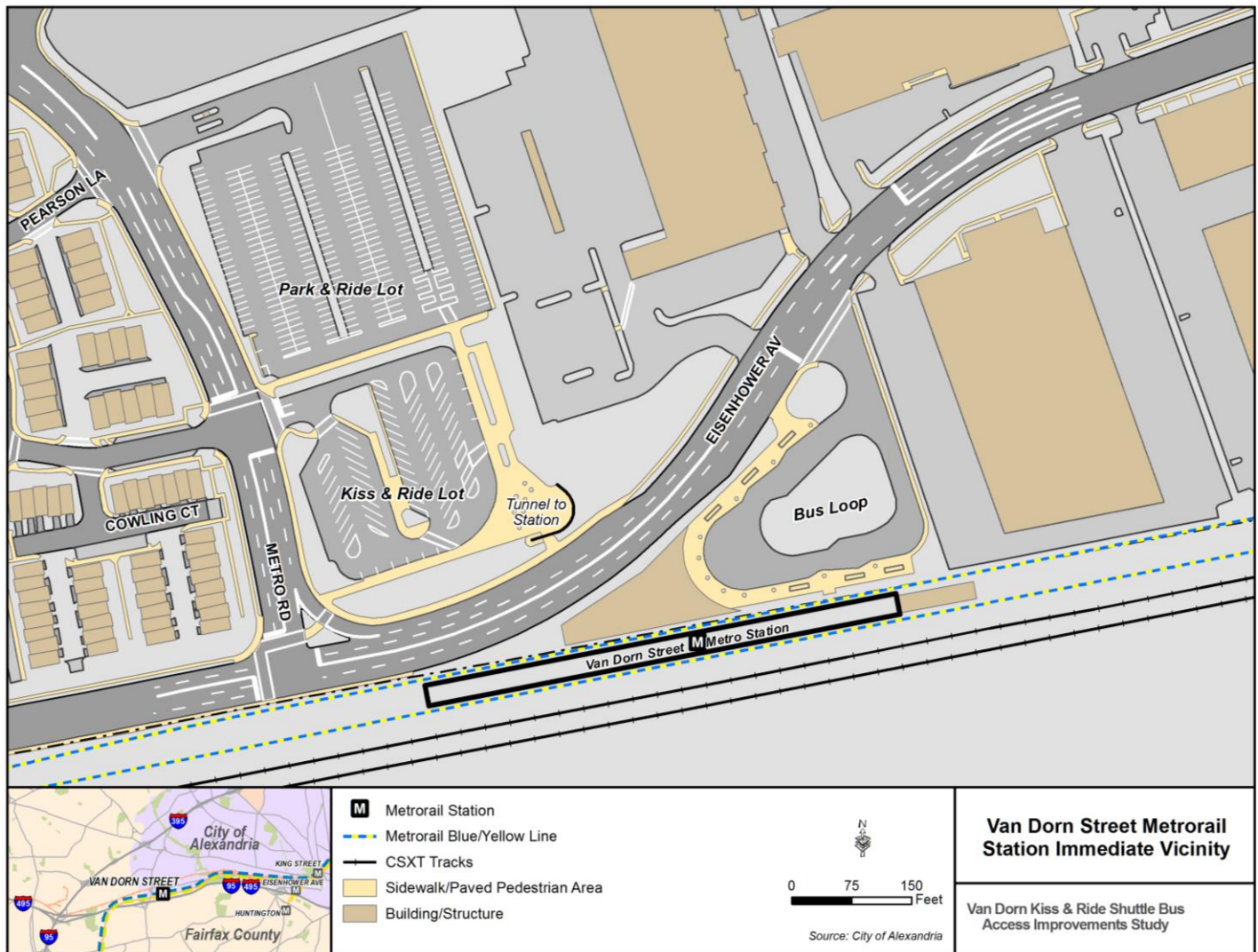
The project team held a workshop on December 19, 2012, to discuss potential short-term, mid-term, and long-term design strategies. Several configurations were presented for the Kiss & Ride (K&R) and Bus Loop. Short-term design strategies could be implemented immediately with minimal costs; mid-term design strategies are envisioned to be implemented by 2018 to correspond with initiation of BRT service; and long-term design strategies are those that would require a substantial capital investment and would be implemented beyond 2018. The design strategies presented are refinements of strategies discussed at the workshop. The technical memorandum is organized as follows:

- 1.0 Introduction
  - 1.1 Existing Station Layout
  - 1.2 Immediate and Short-Term Improvement Recommendations
  - 1.3 Performance Measures and Evaluation Matrix Development
- 2.0 Kiss & Ride Design Improvement Strategies
  - 2.1 Short-Term Strategies
  - 2.2 Mid-Term Strategies
  - 2.3 Kiss & Ride Evaluation Matrix
- 3.0 Bus Loop Design Strategies
- 4.0 Long-Term Design Strategies

### 1.1 Existing Station Layout

The Station site is situated on both sides of Eisenhower Avenue, with Park & Ride and Kiss & Ride areas on one side, and the Bus Loop on the other side (See **Figure 1-1**). The Park & Ride is a surface parking lot with 361 all-day parking spaces; the Bus Loop has six bays and five lay over spaces; and the Kiss & Ride consists of a pick-up/drop-off lane for vehicles and taxis, 52 short-term metered spots, 20 bike racks, and six bike storage lockers. Within the Station site, there are two pedestrian entrances into the station located adjacent to the Bus Loop and the Kiss & Ride.

Figure 1: Van Dorn Metrorail Station Immediate Vicinity



## 1.2 Immediate and Short-Term Improvement Recommendations

The design strategies described in this memorandum are based on the assessment of existing station facility and access conditions reported in the *Existing Conditions Technical Memorandum* and on discussions with the project management team. The design strategies address the following station needs:

- Improve the circulation of shuttles, taxis, and passenger vehicles in the Kiss & Ride;
- Improve pedestrian safety within the Kiss & Ride; and
- Increase the capacity of the Bus Loop to meet anticipated future demand.

Based on comments discussed at the Project Management Team, the design strategies were developed under the following parameters:

- No impact to existing Park & Ride;
- No impact to ADA access for distance convenient;
- Convenient shuttle access to station; and
- Conflict (vehicular) avoidance.



### 1.3 Performance Measures and Evaluation Matrix Development

An Evaluation Matrix was developed to assess how well each design strategy addresses the project's goals and objectives. A set of performance measures was developed to measure the effectiveness of the strategies. The goals and the corresponding measures are listed below:

#### Goal 1: Improve Shuttle Access

**Measures:**

- Provide additional shuttle space to accommodate future growth
- Designate separate shuttle drop off/pick up area
- Convenience for passengers - proximity and accessibility of shuttle drop off areas to station entrance
- Designate separate shuttle queuing area

#### Goal 2: Improve K&R Circulation and Pedestrian Access

**Measures:**

- Improve circulation within the K&R
- Improve pedestrian safety
- Minimize pedestrian and automobile conflicts
- Reduce congestion exiting K&R

#### Goal 3: Minimize removal of short-term parking spaces and station disruption

**Measures:**

- Number of parking spaces removed
- Capital improvement required (none, minimal, or high)
- Re-circulation / traffic pattern changes (yes or no)

### 2.0 Kiss & Ride Design Improvement Strategies

This section of the report describes and illustrates four short-term and four mid-term design strategies for improving the shuttle, taxi, and passenger vehicle circulation and pedestrian safety of the Kiss & Ride. The alternatives are labeled B1 through B9 and are accompanied by a short-description, graphical illustration of the proposed improvement strategy, and a summary evaluation of the option using the performance measures described above. Either a check mark or an "x" denotes the ratings in the summary evaluation - either a design strategy addresses or does not address the performance measure. These symbols do not represent the degree to how well the design strategy addresses the improvement need. A comparison of the design options and a qualitative rating and comparison of the design options are summarized in the Evaluation Matrix in **Section 2.3**.

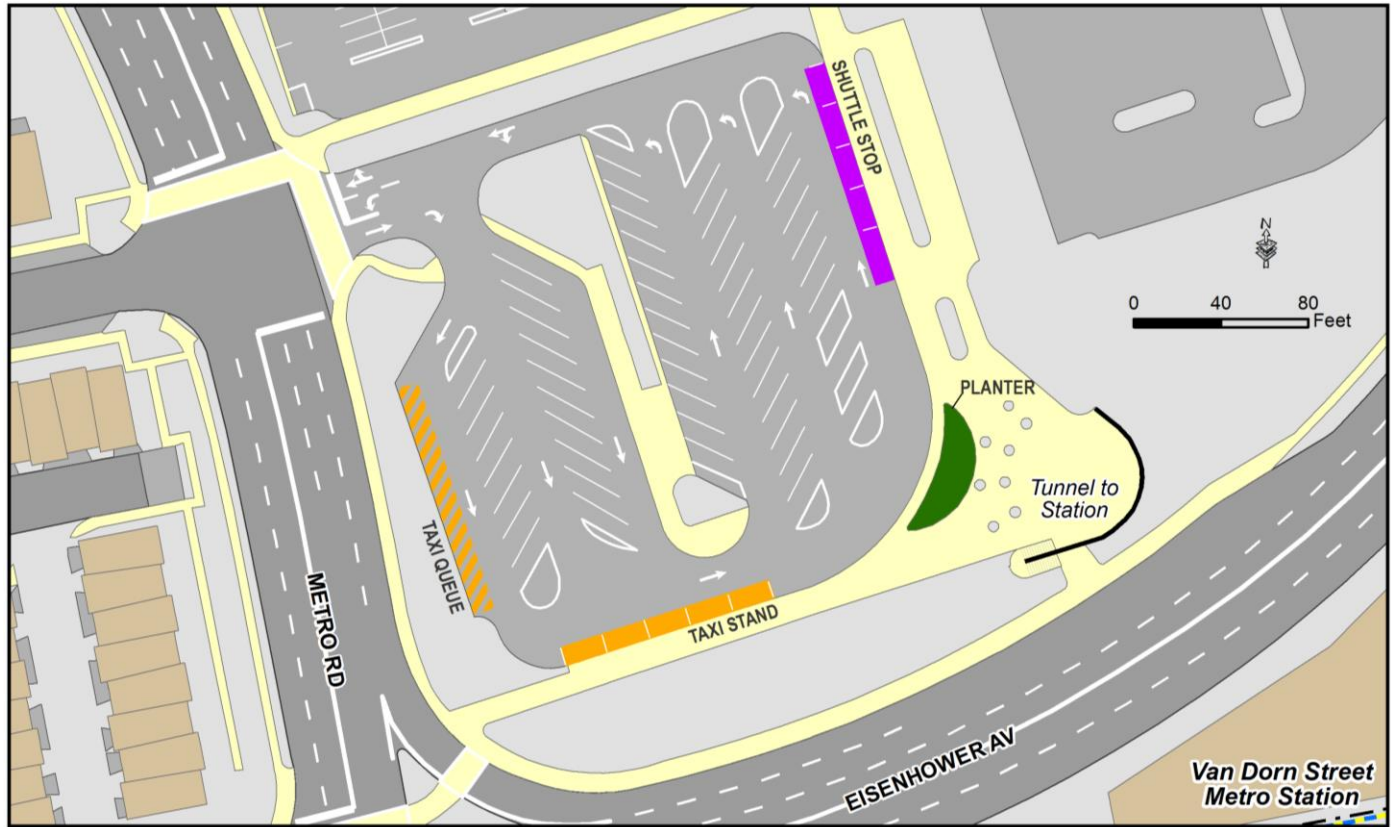
## 2.1 Short-Term Strategies

### B1- Designate Shuttle Drop off at Curb

- Designate a shuttle stop area at the northeast corner of the K&R
- Designate taxi waiting area and stand
- Install a planter to help divert pedestrians away from crossing in the center

This option would improve pedestrian safety and improve internal circulation of the K&R by designating a specific shuttle stop area. Currently, taxis queue along the curb closest to Eisenhower Avenue and Metro Road; this option designates a taxi stand on the curb near Eisenhower Avenue. A separate shuttle waiting area is not provided and the designated shuttle stop area could be too small to accommodate all shuttles. To accommodate the designated shuttle stop pick up area, four parking spaces would be removed

Figure B1: Designate Shuttle Drop off at Curb



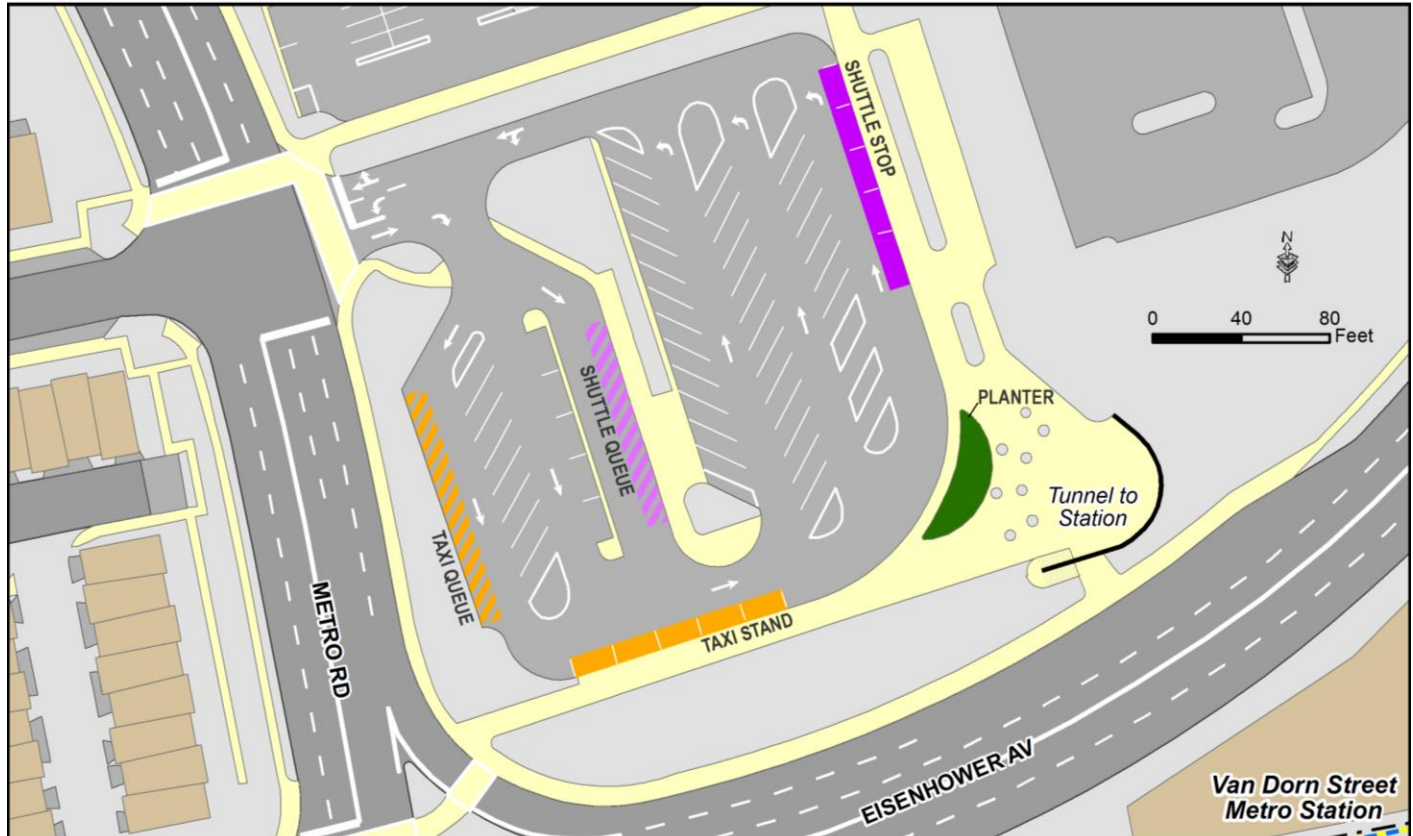
Measure	Rating
Provide additional shuttle space to accommodate future growth	x
Designate separate shuttle drop off/pick up area	✓
Convenience for passengers- proximity and accessibility of shuttle drop off areas to station entrance	✓
Designate separate shuttle queuing area	x
Improve circulation within the K&R	✓
Improve pedestrian safety	✓
Minimize pedestrian and automobile conflicts	✓
Reduce congestion exiting K&R	✓
Number of parking spaces removed	4
Capital improvement required	no
Re-circulation/traffic pattern changes	✓

## B2- Designate Shuttle Drop off and Queuing Area

- Designate a shuttle stop area at the northeast corner of the K&R
- Designate a shuttle queuing area along center median
- Convert 10 diagonal existing K&R spots into 5 parallel spots

This option would improve circulation by designating a shuttle queuing area. All other vehicles would circulate around the K&R similar to existing conditions. The designated shuttle stop and queuing area may be too small to meet the future shuttle demand needs. This option also designates a taxi stand on the curb near Eisenhower Avenue and the planter would divert pedestrians from crossing in the center of the K&R (Same as Option B1). To accommodate the shuttle queuing area and stop area, nine parking spaces would be removed.

Figure B2: Designate Shuttle Drop off and Queuing Area



Measure	Rating
Provide additional shuttle space to accommodate additional growth	×
Designate separate shuttle drop off/pick up area	✓
Designate separate shuttle queuing area	✓
Support passenger convenience – shuttle drop off area is close to station entrance	✓
Improve circulation within the K&R	✓
Improve pedestrian safety	✓
Minimize pedestrian and automobile conflicts	✓
Reduce congestion exiting K&R	×
Number of parking spaces removed	9
Capital improvement required	✓
Re-circulation/traffic pattern changes	✓



### B3- Restripe and remove two parking spaces in center lane to improve circulation

This option increases circulation space at the most congested area in the K&R, but would require removal of two parking spaces. This modification will provide space to pass a vehicle stopped near the station entrance (see blue arrows). This option can be implemented alone or jointly with Options B1 and B2.

Figure B3: Restripe and remove two parking spaces in center lane to improve circulation

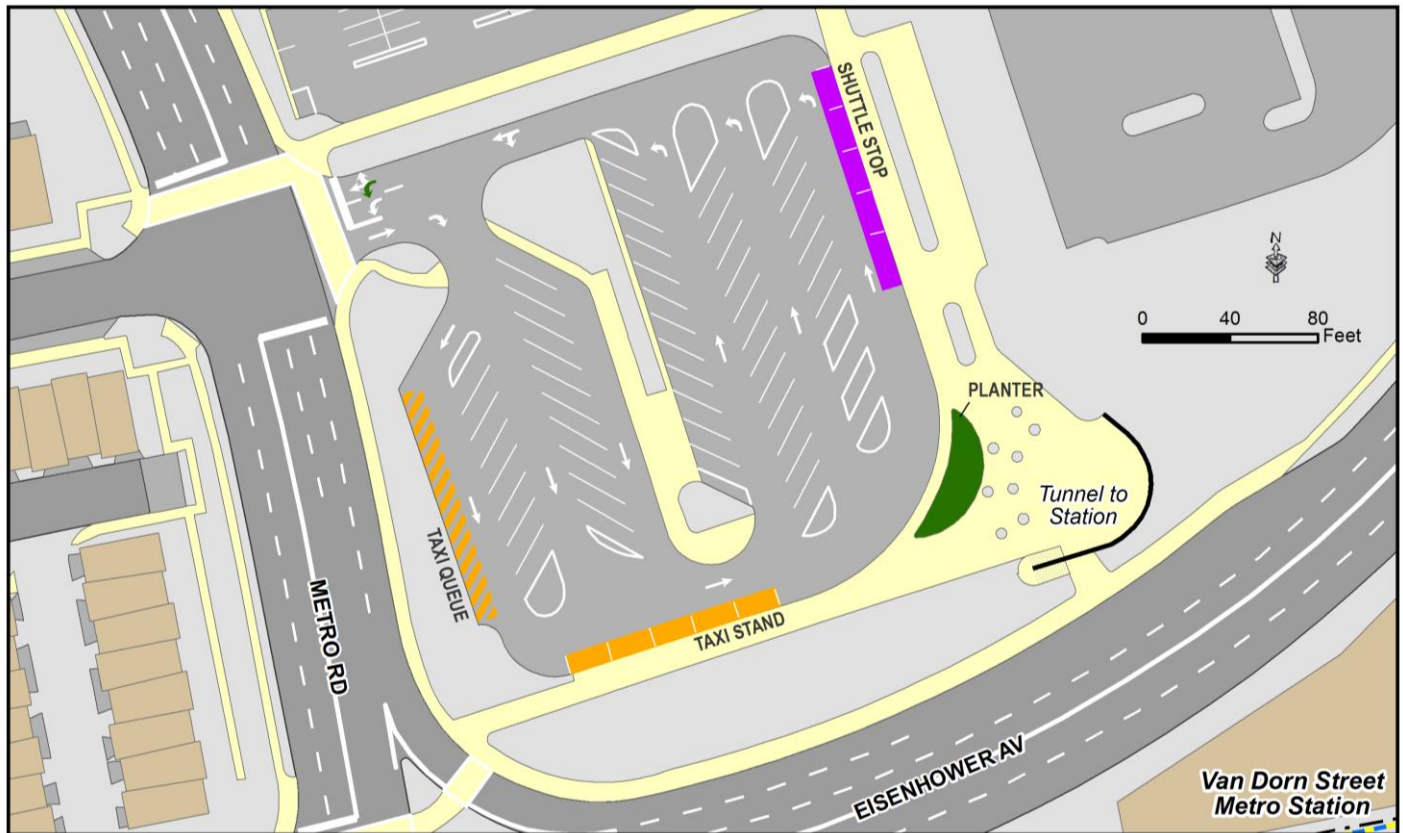


Measure	Rating
Provide additional shuttle space to accommodate additional growth	x
Designate separate shuttle drop off/pick up area	✓
Designate separate shuttle queuing area	x
Support passenger convenience – shuttle drop off area is close to station entrance	✓
Improve circulation within the K&R	✓
Improve pedestrian safety	✓
Minimize pedestrian and automobile conflicts	✓
Reduce congestion exiting K&R	x
Number of parking spaces removed	6
Capital improvement required	x
Re-circulation/traffic pattern changes	✓

## B4- Permit left hand turns from both lanes exiting the Kiss & Ride

This option allows left hand turns from both lanes, which would help reduce the queue length for cars trying to turn left out of the station. The current through/right lane would be changed to through/right/left. This option could be jointly implemented with any other option. Four parking spaces would be removed to accommodate the shuttle stop.

Figure B4: Permit left hand turns from both lanes exiting the Kiss & Ride



Measure	Rating
Provide additional shuttle space to accommodate additional growth	x
Designate separate shuttle drop off/pick up area	✓
Designate separate shuttle queuing area	x
Support passenger convenience – shuttle drop off area is close to station entrance	✓
Improve circulation within the K&R	✓
Improve pedestrian safety	✓
Minimize pedestrian and automobile conflicts	✓
Reduce congestion exiting K&R	x
Number of parking spaces removed	4
Capital improvement required	x
Re-circulation/traffic pattern changes	✓

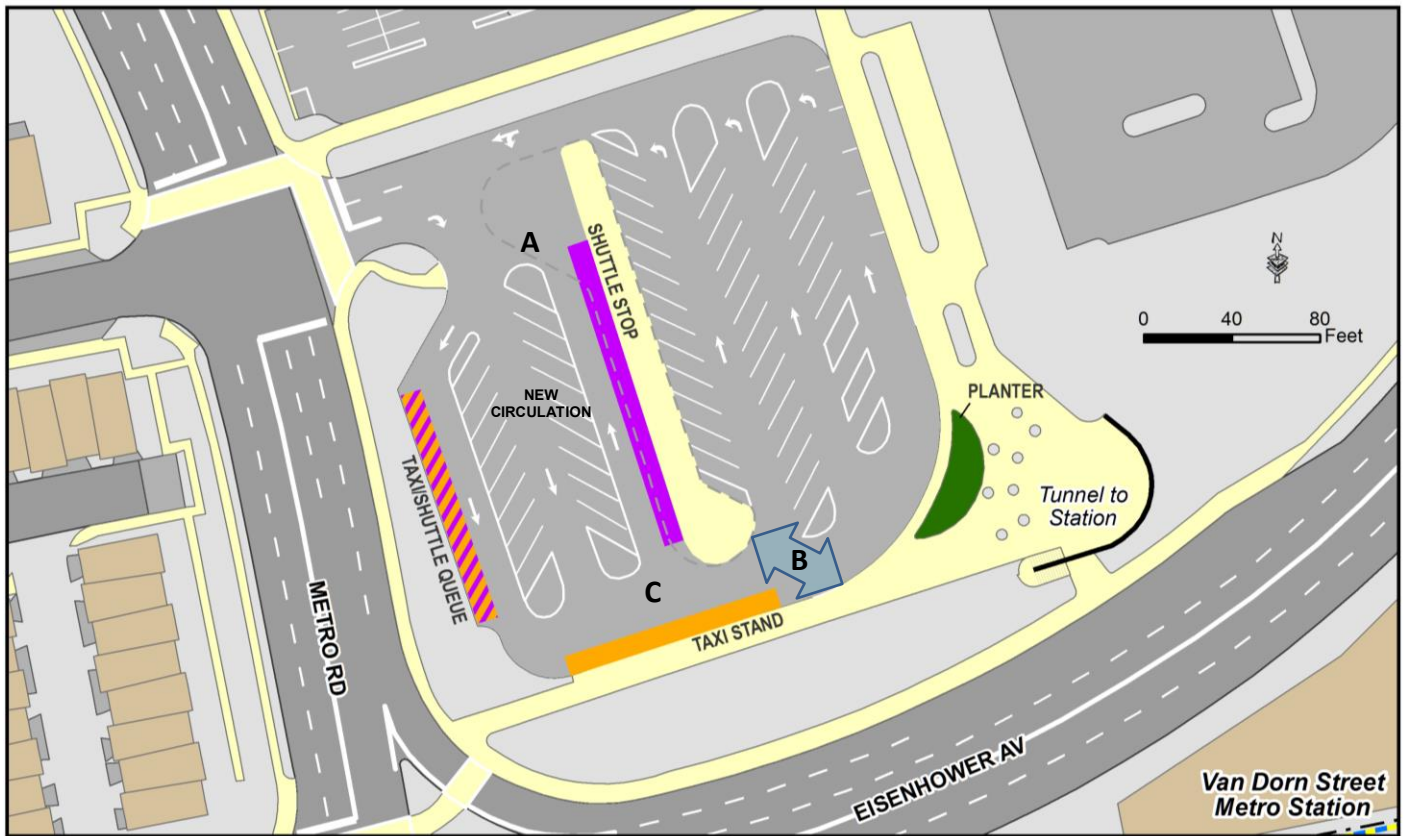
## 2.2 Mid-Term Strategies

### B5- Separate Shuttle Island Configuration

- Reconfigure median as passenger zone for shuttles
- Designate shuttle stop area and queuing area on the west side of median
- Change shuttle circulation

This option would improve circulation by separating shuttle circulation and creating a shuttle stop area at a modified median. Shuttle passengers would be dropped off slightly further away from the station and would need to use a crosswalk to access the station entrance. All other vehicles would continue to circulate similarly to existing conditions; however, there is potential for congestion near the exit (see “A”), pedestrians must cross the internal roadway to access shuttle stop median (see “B”), and there are relatively tight turns for shuttles and potential for conflicts with taxis (See “C”). One parking space would be removed.

Figure B5: Separate Shuttle Island Configuration



Measure	Rating
Provide additional shuttle space to accommodate additional growth	x
Designate separate shuttle drop off/pick up area	✓
Designate separate shuttle queuing area	✓
Support passenger convenience – shuttle drop off area is close to station entrance	✓
Improve circulation within the K&R	✓
Improve pedestrian safety	✓
Minimize pedestrian and automobile conflicts	✓
Reduce congestion exiting K&R	x
Number of parking spaces removed	1
Capital improvement required	✓
Re-circulation/traffic pattern changes	✓

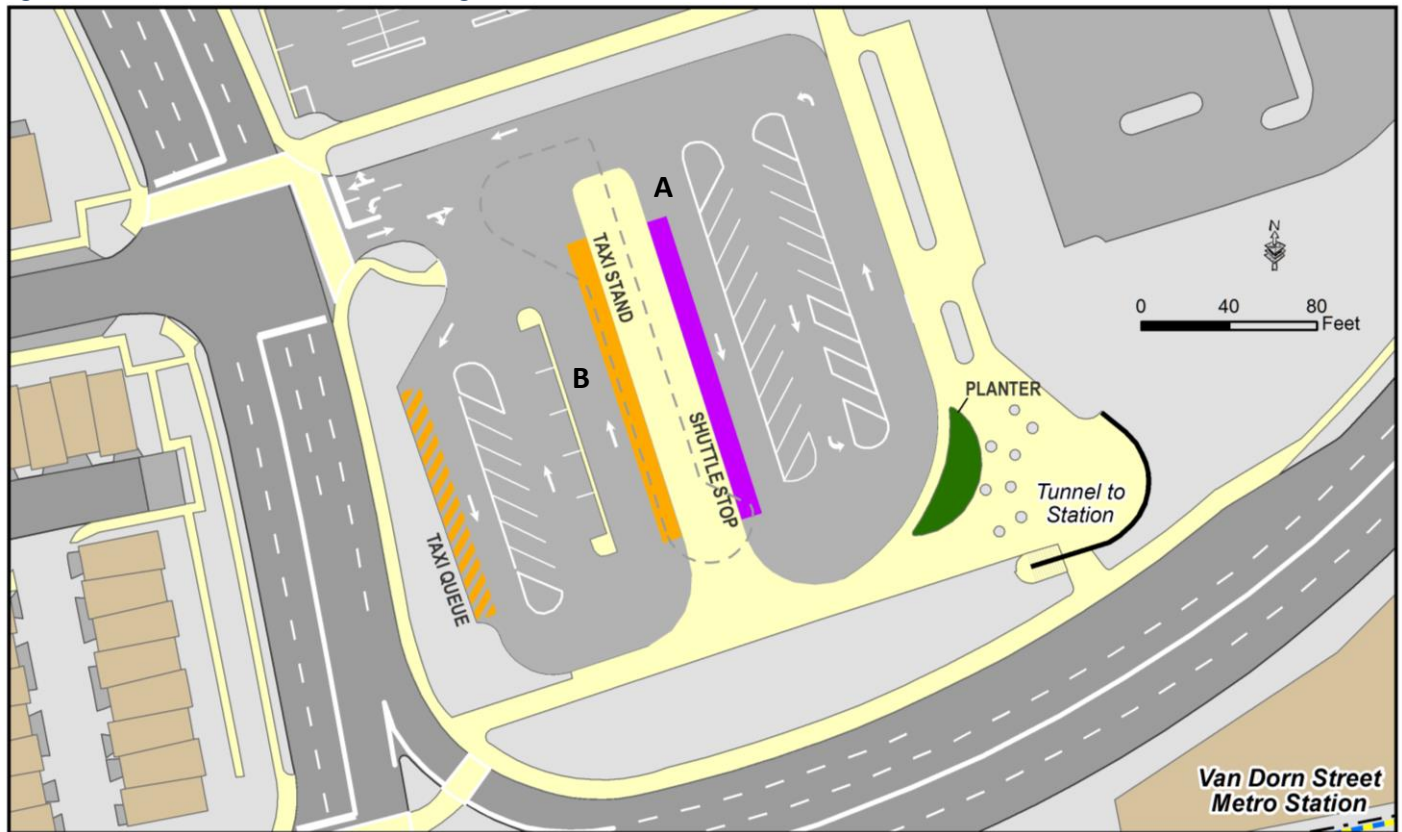


## B6- Shuttle and Taxi Median Configuration

- Modify existing median to separate a designated shuttle-only stop area on east side of median
- Change existing shuttle circulation patterns
- Designate taxi stand waiting area on the west side of median
- Separate shuttle and taxi circulation

This option modifies the existing median and results in east and west K&R areas. Passenger vehicles have the option of dropping passengers off or parking on either side of the median. Vehicles access east K&R via lane shared with shuttles (see “A”). This option provides more direct access from shuttles to the station entrance, as pedestrians do not need to cross a roadway to access the stop zone; however, conflicts could arise from vehicles using west K&R must exit by shared lane with taxis (see “B”).

Figure B6: Shuttle and Taxi Median Configuration



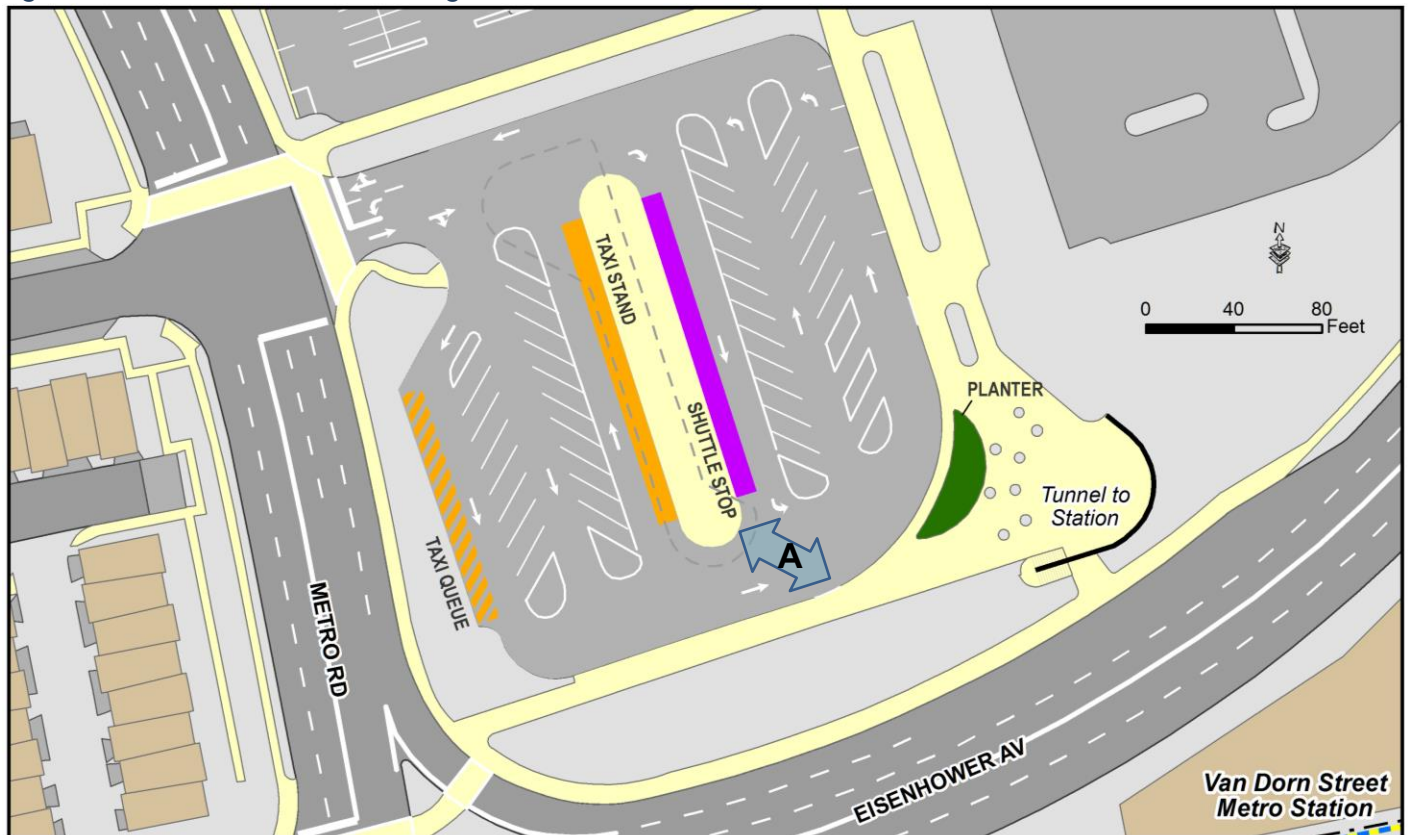
Measure	Rating
Provide additional shuttle space to accommodate additional growth	×
Designate separate shuttle drop off/pick up area	✓
Designate separate shuttle queuing area	✓
Support passenger convenience – shuttle drop off area is close to station entrance	✓
Improve circulation within the K&R	✓
Improve pedestrian safety	✓
Minimize pedestrian and automobile conflicts	✓
Reduce congestion exiting K&R	×
Number of parking spaces removed	15
Capital improvement required	✓
Re-circulation/traffic pattern changes	✓

## B7- Shuttle and Taxi Island Configuration

- Modify existing median to serve as a designated passenger zone for shuttles and taxis
- Designate shuttle stops on east side of median
- Designate taxi stand on west side of median
- Designate lanes as “shuttle only” and “taxi only”

This option reconfigures the existing median and alters the existing shuttle and taxi circulation patterns. Taxi and shuttles circulate in the opposite direction of passenger vehicles, but in exclusive lanes; however, pedestrians must cross the internal roadway to access median (see “A”). Fourteen parking spots would be removed.

Figure B7: Shuttle and Taxi Island Configuration



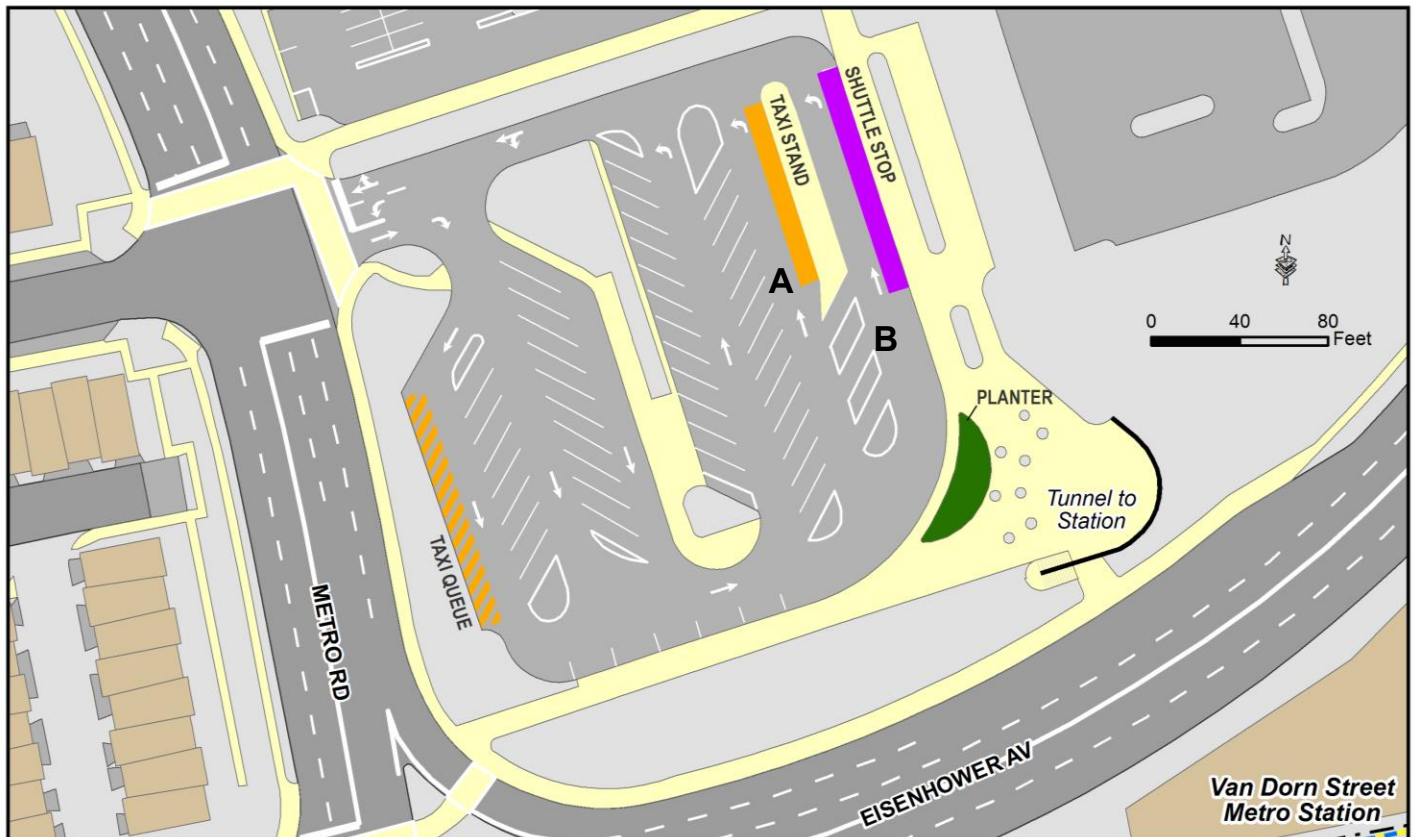
Measure	Rating
Provide additional shuttle space to accommodate additional growth	x
Designate separate shuttle drop off/pick up area	✓
Designate separate shuttle queuing area	x
Support passenger convenience – shuttle drop off area is close to station entrance	✓
Improve circulation within the K&R	✓
Improve pedestrian safety	✓
Minimize pedestrian and automobile conflicts	✓
Reduce congestion exiting K&R	x
NEW CIRCULATION	
Number of parking spaces removed	14
Capital improvement required	✓
Re-circulation/traffic pattern changes	✓

## B8- Shuttle Stop and Taxi Median Separate Shuttle Configuration

- Designate a new shuttle stop area at the northeast corner of the K&R
- Install a new median as a designated stop area for taxis
- All circulation stays the same

This option helps improve circulation by providing a designated shuttle stop area adjacent to existing bike lockers and taxi stop area; this option would improve safety for shuttle users who would not have to cross the K&R to enter the station. Taxis, private vehicles, and shuttles would follow the existing circulation patterns; however, because shuttle and taxi queues may block lanes, other vehicles using the eastern most lanes may face periodic delays (see “A” and “B”). Ten parking spaces would be removed to allow space for the new median.

**Figure B8: Shuttle Stop and Taxi Median Separate Shuttle Configuration**



Measure	Rating
Provide additional shuttle space to accommodate additional growth	x
Designate separate shuttle drop off/pick up area	✓
Designate separate shuttle queuing area	x
Support passenger convenience – shuttle drop off area is close to station entrance	✓
Improve circulation within the K&R	✓
Improve pedestrian safety	✓
Minimize pedestrian and automobile conflicts	✓
Reduce congestion exiting K&R	x
Number of parking spaces removed	10
Capital improvement required	✓
Re-circulation/traffic pattern changes	✓

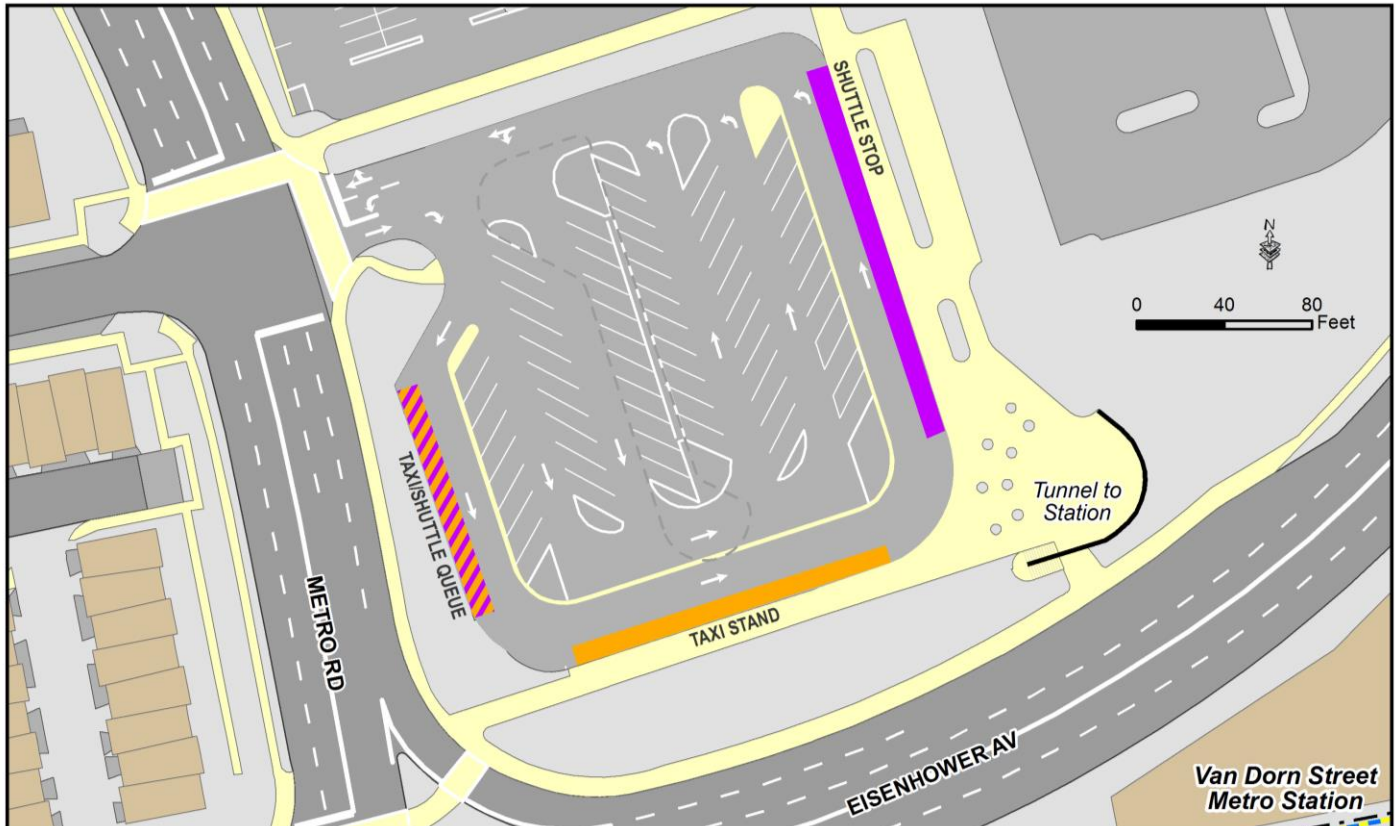


## B9- Center Parking with Exclusive Shuttle and Taxi Circulation and Stops

- Reconfigure existing K&R and move all parking to center
- Private vehicles dropping off/picking-up and parking would utilize the center area, while shuttles and taxis would circulate around the outer edge
- Designate shuttle stop queuing and drop-off area along outer edge (east side) of K&R
- Designate taxi queuing and drop-off along south end of K&R

This option helps improve taxi and shuttle circulation, but would require substantial disruption to the existing K&R. The needed turning radii may not be achievable for large shuttles in this configuration. This option would provide three additional parking spaces.

Figure B9: Center Parking with Exclusive Shuttle and Taxi Circulation Stops



Measure	Rating
Provide additional shuttle space to accommodate additional growth	x
Designate separate shuttle drop off/pick up area	✓
Designate separate shuttle queuing area	✓
Support passenger convenience – shuttle drop off area is close to station entrance	✓
Improve circulation within the K&R	✓
Improve pedestrian safety	✓
Minimize pedestrian and automobile conflicts	✓
Reduce congestion exiting K&R	x
Number of parking spaces removed	0 (+3)
Capital improvement required	✓
Re-circulation/traffic pattern changes	✓

## 2.3 Kiss & Ride Evaluation Matrix

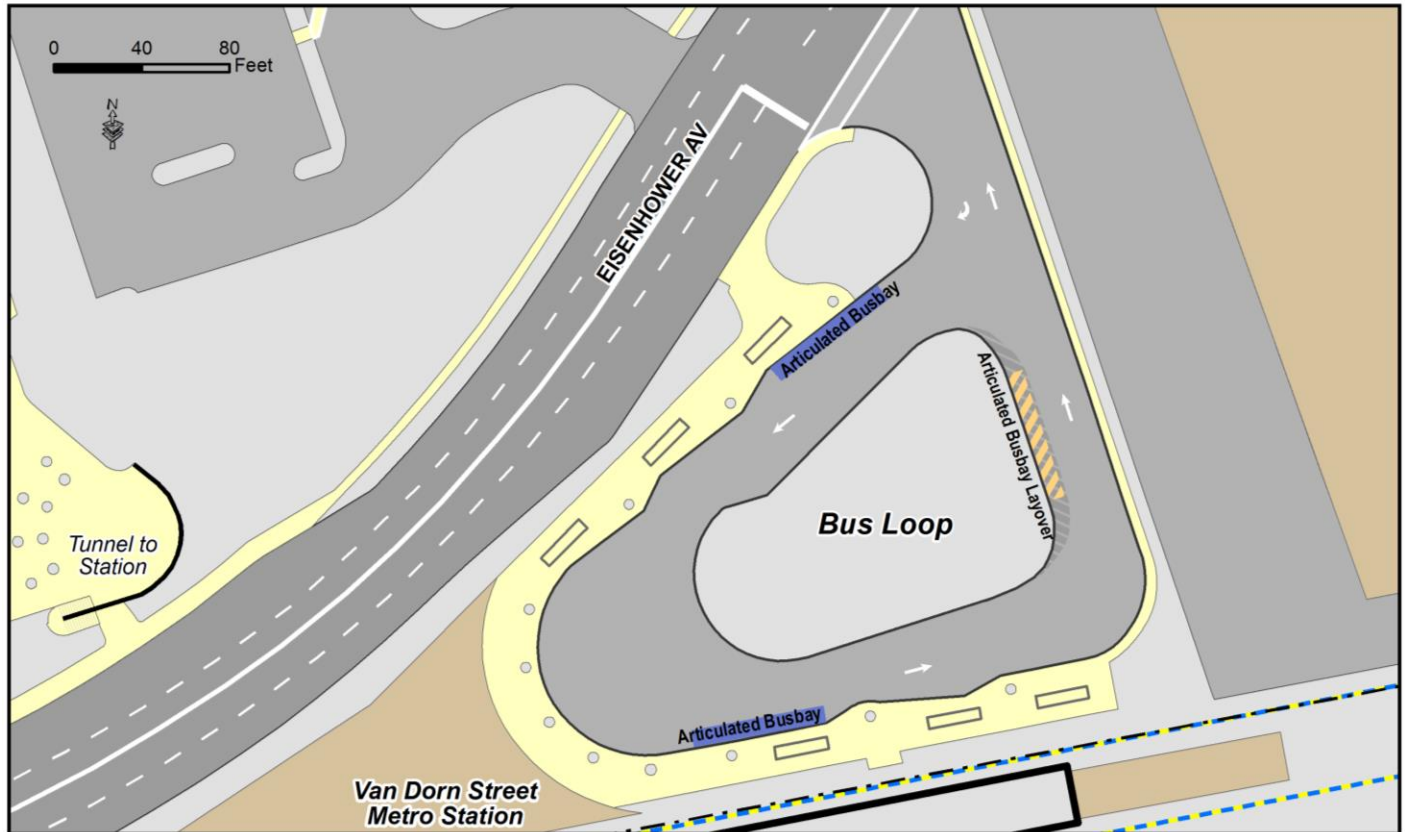
Alternatives Evaluation Summary									
<b>Key to Ranking:</b> <div> <div>Lower Performing</div> <div>Higher Performing</div> </div>	B1	B2	B3	B4	B5	B6	B7	B8	B9
<b>Improve Shuttle Access</b>									
Provide additional shuttle space to accommodate additional growth	no	no	no	no	no	no	no	no	no
Designate separate shuttle drop off/pick up area	✓	✓	✓	✓	✓	✓	✓	✓	✓
Convenience for passengers- proximity and accessibility of shuttle drop off areas to station entrance	✓	✓	✓	✓	✓	✓	✓	✓	✓
Designate separate shuttle queuing area	no	✓	no	no	✓	no	no	no	✓
<b>K&amp;R Circulation and Pedestrian Access</b>									
Improve Circulation within the K&R	✓	✓	✓	✓	✓	✓	✓	✓	✓
Improve pedestrian safety	✓	✓	✓	no	✓	✓	✓	✓	✓
Minimize pedestrian and automobile conflicts	✓	✓	✓	no	✓	✓	✓	✓	✓
Reduce congestion exiting K&R	✓	✓	✓	✓	✓	✓	✓	✓	✓
<b>Minimize reduction in short-term parking loss and station disruption</b>									
Number of parking spaces removed	4	9	6	4	1	21	14	10	add 3
Capital improvement required	no	Very minimal	no	no	Minimal	Minimal	Minimal	Minimal	High Change
Re-circulation / traffic pattern changes	Slight Change	Slight Change	no	Slight change	Moderate Change	Moderate Change	High Change	Slight Change	High Change

### 3.0 Bus Loop Design Strategies

#### 3.1 Short and Mid-Term Strategies

The Bus Loop can be reconfigured to provide two additional bus bays and one new lay-over space for a 60-foot articulated bus. A bus bay for an articulated bus (60-foot) could be designated along the western portion of the Bus Loop, near the front entrance, or along the eastern side. The center median would need to be modified slightly—remove a portion of the wall near the eastern edge (see figure below). The advantages of these design strategies include minimum cost and ease of implementation; however, these short-term strategies do not allow for future expansion without significant capital investment.

Figure B10: Bus Loop Design Strategy





## 4.0 Long-term Strategies

Three long-term design strategies that provide increased capacity for both the K&R and Bus Loop are described below. These strategies could require significant capital investment, land acquisitions, and other costs.

- **Strategy A:** Expand WMATA property east of the Bus Loop by acquiring all or part of adjacent parcel (see “Site A”). Bus Loop capacity could therefore be expanded by adding bus bays. Alternatively, bus and K&R operations could be switched.
- **Strategy B:** Expand the K&R by acquiring UPS property on the north side of Eisenhower Avenue (see “Site B”). The K&R and Park & Ride could be expanded east, with vehicular access to Eisenhower Avenue at an intersection aligned with the Bus Loop. Some bus routes could be assigned to the north side of the station. Opportunities for joint development may be limited for this parcel while Covanta property is in operation.
- **Strategy C:** If a connector road is built in Fairfax County, linking Vine Street to Oakwood, expand south and provide pedestrian and vehicular access to a parcel on Vine street (See “Site C”) (via the existing knock-out panel or otherwise). Separate, additional K&R, Park & Ride, and bus operations could be located here and capture demand from the south, alleviating demand on existing facilities.

Figure B10: Long-Term Design Strategies



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# **Appendix B**

## **Detailed Bus and Shuttle Information**



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# Detailed Bus and Shuttle Information

## 1. Bus

### Metrobus Routes Serving the Station

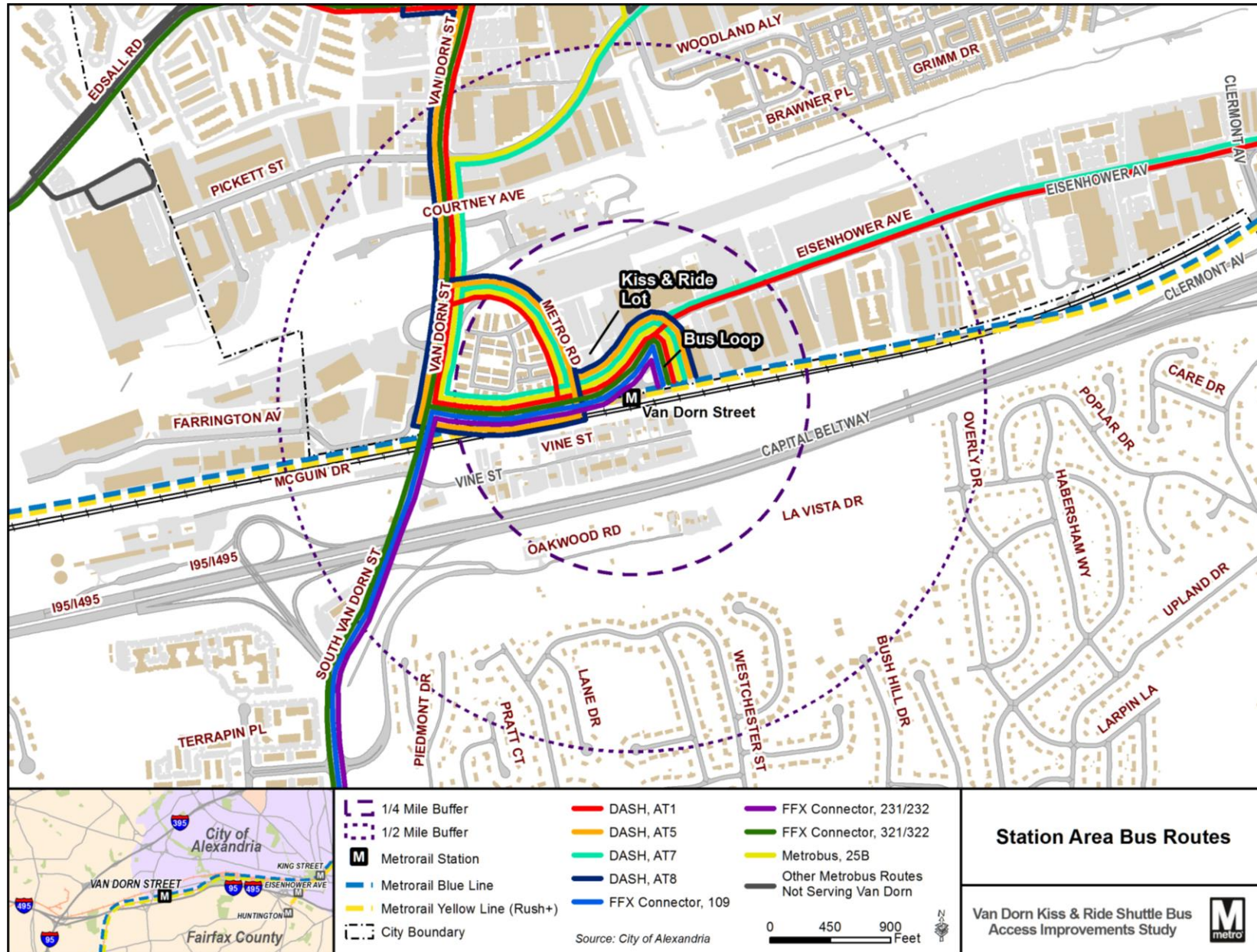
One Metrobus route, four DASH (Alexandria Transit Company) routes and five Fairfax Connector routes serve the Van Dorn Street Metrorail station. These are described in detail below and the routes are shown in **Figure 1-1**. The Van Dorn Street Metrorail station includes an off-street Bus Loop with six bus bays as well as additional layover spaces. The implications of these activities will be described subsequently in “Metrobus Vehicle Activity”. Route alignments are described below and operating characteristics summarized in **Table 1-1**.

**Metrobus Route 25B** – Metrobus Route 25B, the Landmark-Ballston Line, connects the Ballston-MU Metrorail station with the Van Dorn Street Metrorail station. The route operates Monday through Saturday along the same alignment during all time periods, except it does not enter the Landmark Mall complex before 7:30 AM. The alignment follows Carlin Springs Road through Arlington County, serving the Arlington Urgent Care Center. In Fairfax County, it serves Bailey’s Crossroads and Skyline City along Leesburg Pike and George Mason Drive. After entering the City of Alexandria, it serves Northern Virginia Community College and Southern Towers near Seminary Road, as well as Inova Alexandria Hospital, Landmark Mall and apartment complexes along Reynolds Street, with the southern terminus of the route at the Van Dorn Street Metrorail station. At the Van Dorn Street Metrorail station, Metrobus Route 25B shares Bus Bay A with DASH Route AT7 service toward Landmark Mall.

**DASH Route AT1** – DASH Route AT1 operates between Seminary Plaza and the Van Dorn Street Metrorail station at all times, with peak period and Sunday service extended to the Eisenhower Avenue Metrorail station, and Saturday service extended past the Eisenhower Avenue Metrorail station to the King Street Metrorail station. This route generally serves the western edge of the City of Alexandria, including Seminary Plaza, Southern Towers, the Beauregard Street Corridor west of I-395, Landmark Mall, and the Van Dorn Street corridor between Landmark Mall and the Van Dorn Street Metrorail station. During the morning and afternoon peak periods and on weekends, Route AT1 also serves Eisenhower Avenue between the Van Dorn Street and Eisenhower Avenue Metrorail stations, while on Saturdays service is extended to the King Street Metrorail station, serving new development along the way. At the Van Dorn Street Metrorail station, northbound service shares Bus Bay B with Routes AT5 and AT8 while southbound service shares Bus Bay C with eastbound service on Route AT7 (which serves a similar alignment east of the Van Dorn Street Metrorail station). Midday and evening service takes layover at the Station.

**DASH Route AT5** – DASH Route AT5 operates between the Braddock Road Metrorail station and the Van Dorn Street Metrorail station via the Van Dorn Street and King Street corridors. In the early morning, some eastbound trips begin at Duke Street and Ripley Street (weekdays) or Landmark Mall (weekends), while the first morning westbound trip (weekdays and weekends) and last evening westbound trip (weekends) terminate at the Landmark Mall. The route generally serves the Van Dorn Street and King Street corridors, and loops through Old Town Alexandria between the King Street and Braddock Road Metrorail stations via King Street, Fairfax Street, and Madison/Montgomery Streets. At the Van Dorn Street Metrorail station, Route AT5 shares Bus Bay B with Route AT8 and northbound service on Route AT1, with layovers taking place at the Station.

Figure 1-1: Station Area Bus Routes





**Table 1-1: Span and Frequency of Bus Routes Serving Van Dorn Street Metrorail Station**

Route	Weekday Span (Entire Route)	Saturday Span (Entire Route)	Sunday Span (Entire Route)	Frequency at Van Dorn Street Station					
				Weekday				Saturday	Sunday
				AM Peak	Midday	PM Peak	Evening		
Metrobus									
25B Northbound	6:04AM-10:26PM	6:19AM-7:59PM	-	30	60	30	-	60-70	-
25B Southbound	6:05AM-9:08PM	6:10AM-9:01PM	-	30	60	30	-	60-70	-
Alexandria Transit Company (DASH)									
AT1 Northbound	5:53AM-11:04PM	7:10AM-11:07PM	9:18AM-8:11PM	30	30	30	-	60	60
AT1 Southbound	5:02AM-10:27PM	7:36AM-10:37PM	8:16AM-7:08PM	30	30	30	-	60	60
AT5 Eastbound	5:16AM-11:09PM	6:58AM-10:49PM	7:48AM-6:31PM	30	30	30	60	30	60
AT5 Westbound	5:31AM-10:56PM	7:07AM-11:37PM	8:00AM-7:59PM	30	30	30	60	30	60
AT7 Eastbound	5:12AM-8:26PM	-	-	30	60	30	-	-	-
AT7 Westbound	5:39AM-9:18PM	-	-	30	60	30	-	-	-
AT8 Eastbound	5:23AM-12:30AM	6:25AM-11:24PM	6:52AM-11:20PM	20	30/60	20	60	60	60
AT8 Westbound	4:56AM-12:14AM	6:27AM-11:46PM	7:19AM-11:28PM	30	60	20	60	60	60
Fairfax Connector									
109 Eastbound	4:59AM-11:25PM	6:30AM-10:54PM	-	30	60	30	40	60	-
109 Westbound	5:10AM-11:32PM	7:00AM-10:25PM	-	30	60	30	40	60	-
231 Counter-Clockwise	4:50-10:08 AM; 3:01-10:14 PM	-	-	30	-	30	60	-	-
232 Clockwise	4:39AM-10:28PM	-	-	30	-	30	60	-	-
321 Counter-Clockwise	4:02AM-10:55PM	6:33AM-11:17PM	6:33AM-11:17PM	30	60	30	60	60	60
322 Clockwise	4:10AM-10:21PM	5:34AM-11:35PM	5:34AM-11:35PM	30	60	30	60	60	60

**DASH Route AT7** – DASH Route AT7 connects the southern portion of Old Town Alexandria with the Landmark Mall via Eisenhower Avenue on weekdays—there is no Saturday or Sunday service. It operates along a one-way loop south of Duke Street in Old Town, serves the King Street and Eisenhower Avenue Metrorail station and new development surrounding the Federal Courthouse, operates along Eisenhower Avenue between the Eisenhower Avenue and Van Dorn Street Metrorail station, and operates along Van Dorn Street, Pickett Street, Holmes Run Parkway and Ripley Street between the Van Dorn Street Metrorail station and the route's terminus at the Landmark Mall. The first few eastbound trips and last few westbound trips of the day begin/end at Duke and Ripley Streets rather than the Landmark Mall. Westbound service on Route AT7 shares Bus Bay A with Metrobus Route 25B, while eastbound service on Route AT7 shares Bus Bay C with southbound service on Route AT1 (which serves a similar alignment east of the Van Dorn Street Metrorail station). This route does not take layover at the Van Dorn Street Metrorail station.



**DASH Route AT8** – DASH Route AT8 connects Old Town Alexandria with the Van Dorn Street Metrorail station via Duke Street. Service operates along Pendleton Street and Washington Street in Old Town Alexandria, Duke Street between Washington Street and the Landmark Mall, and Van Dorn Street, Stevenson Street, Whiting Street, Edsall Road and Eisenhower Avenue between Duke Street and the Van Dorn Street Metrorail station. Short-turn trips operate along Duke Street between the King Street Metrorail station and the Landmark Mall during weekday midday, PM peak and early evenings, as well as throughout the day on weekends. Eastbound trips do not serve Landmark Mall before 9:00 AM on weekdays, 8:30 AM on Saturdays, or 8:00 AM on Sundays; most first/last trips of the day in both directions also skip Landmark Mall. Route AT8 shares Bus Bay B at the Van Dorn Street Metrorail station with northbound service on Route AT1 and eastbound service on Route AT5, with all trips that serve the Station terminating and/or taking layover there.

**Fairfax Connector Route 109** – Fairfax Connector Route 109, the Rose Hill Line, connects the Van Dorn Street and Huntington Metrorail stations on weekdays and Saturdays. The route operates along Van Dorn Street, Franconia Road, Rose Hill Drive, Telegraph Road, and Huntington Avenue in both directions, with service in both directions operating a counter-clockwise loop along Oakwood Drive and Crown Royal Drive. Eastbound service before 9:00 AM and westbound service after 3:30 PM skips the loop along Oakwood and Crown Royal Drives. Route 109 utilizes Bus Bay D at the Van Dorn Street Metrorail station as its western terminus, with layovers taking place at the Station. It is the only route to have its own bus bay at the Station.

**Fairfax Connector Routes 231 and 232** – Fairfax Connector Routes 231 and 232, the Kingstowne Circulator, operate weekday peak period service along a large loop through the Kingstowne and Franconia areas of unincorporated Fairfax County. Route 231 operates counter-clockwise around the loop, while Route 232 operates clockwise around the loop. The routes serve the Franconia-Springfield and Van Dorn Street Metrorail stations, as well as developments along Beulah Street, Kingstowne Village Parkway and South Van Dorn Street. Route 231 shares Bus Bay E at the Van Dorn Street Metrorail station with Route 321, while Route 232 shares Bus Bay F with Route 322. Routes 231 and 232 both take layover at the Franconia-Springfield Metrorail station, and not at the Van Dorn Street Metrorail station.

**Fairfax Connector Routes 321 and 322** – Fairfax Connector Routes 321 and 322, the Greater Springfield Circulator, operate a large loop through Franconia, Springfield and Kingstowne in unincorporated Fairfax County, as well as serving the Van Dorn Street Metrorail station in the City of Alexandria. Route 321 operates counter-clockwise around the loop, while Route 322 operates clockwise around the loop. The routes serve the Franconia-Springfield and Van Dorn Street Metrorail stations and the Springfield Mall Park & Ride, as well as developments along Franconia-Springfield Parkway, Old Keene Mill Road, Hanover Avenue, Backlick Road, Edsall Road, South Van Dorn Street and Kingstowne Village Parkway. Route 321 shares Bus Bay E at the Van Dorn Street Metrorail station with Route 231, while Route 322 shares Bus Bay F with Route 232. Routes 321 and 322 both take layover at the Van Dorn Street Metrorail station.

### Metrobus Vehicle Activity

In addition to serving the Van Dorn Street Metrorail station, several Metrobus, DASH and Fairfax Connector routes also use the Station as a terminal. **Table 1-2** presents the number of buses that serve the Station (in terms of departures) for a typical weekday.

**Table 1-2: Typical Weekday Bus Activity at Van Dorn Street Metrorail Station Bus Bays**

Period	Bus Departures
AM Peak Hour (6:30AM - 7:29AM)	27
PM Peak Hour (5:00PM - 5:59PM OR 5:30PM - 6:29PM)	26
Remainder of Day	261
TOTAL Typical Weekday	314

Source: Public timetables, accessed October 1, 2012;

## 2. Shuttle Activity in the Van Dorn Street Metrorail Station Kiss & Ride

Currently, approximately 41 private shuttle buses serve the Van Dorn Street Metrorail Station per hour during the peak period. Shuttle buses that are 26 feet in length or shorter are granted access to the Kiss & Ride lot, while those exceeding 26 feet are required to stop at a designated point along Eisenhower Avenue near the entrance to the bus loop. Currently, approximately 68 percent of the shuttle buses are short enough to serve the Kiss & Ride, while the remaining 32 percent are required stop along Eisenhower Avenue. This section focuses on capacity of the Kiss & Ride to house shuttle activity, which is projected to grow by 44 percent by 2030, and by 63 percent by 2040<sup>1</sup>.

Video taken on October 25, 2012 showed a maximum of 28 shuttle buses per hour using the Kiss & Ride during the AM peak period, and a maximum of 18 shuttle buses per hour during the PM peak period. During the morning (between 6:00 AM and 12:00 PM), shuttle buses spent an average of 3:23 in the Kiss & Ride, which breaks down to 2:40 of dwell time and 00:43 of movement. During the afternoon/evening (between 1:00 PM and 7:00 PM), shuttle buses spent an average of 13:37 in the Kiss & Ride, with 13:05 of dwell/layover time and 00:33 of movement. The difference in dwell times between the morning and afternoon is attributed to the majority of shuttle buses serving local residents (apartment complexes and/or hotel guests) rather than employers: in the morning, shuttle buses drop off passengers at the station and promptly return whence they came to pick up more, while in the afternoon/evening the shuttle buses will wait until they are reasonably full before departing to take passengers home.

In order to provide a conservative estimate of capacity, it was assumed that all shuttle buses were of the maximum length (26 feet) allowed in the Kiss & Ride, and thus each shuttle would require 40-45 feet of curb frontage for independent operation within the stop (meaning that shuttle buses can pull in and out at will, and do not have to wait for other shuttle buses to move out of their way). Given the competitive nature of shuttle bus operations, independent operations were assumed for all shuttle buses. For the AM peak period, an average dwell time of 2:40 (from the observations cited above) was assumed. For the PM peak period, an average dwell time of 13:05 (October 25, 2012 observations) was used where layovers were assumed to take place in the shuttle stop; where layovers were assumed to take place on street or in a designated shuttle queuing area, 3:05 was attributed to dwell time (in the stop) with the remaining 10 minutes of layover time assumed to take place on-street.

In order to estimate the approximate year in which shuttle activity in the Kiss & Ride would exceed capacity for each of the lot configurations, an average growth rate of 2.2 percent per year in the number of shuttle buses serving the lot—approximately representing the projected growth rates from WMATA's August 2011 *Shuttle Services at Metro Facilities*. To estimate capacity, the designated shuttle stop area was divided into as many complete 45-foot stops as possible. The maximum number of shuttle buses was calculated separately for each stop location and summed for the entire stop area. Then, based on a 2.2 percent per year estimated growth rate from 28 shuttle buses per hour during the AM peak and 18 shuttle buses per hour during the PM peak, the year at which shuttle activity in the Kiss & Ride would exceed capacity was estimated for each the AM and PM peak periods. It is important to note that in reality, shuttle activity will likely not grow at a steady 2.2 percent per year; instead, increases in shuttle activity will be more closely tied to the rate of development in the area surrounding the Metrorail station. Thus the "estimated year shuttle capacity exceeded" should be viewed with caution, with more weight given to the maximum number of shuttle buses per hour that each configuration could accommodate.

Each option is calculated twice, once assuming that shuttle layovers take place on-street, and once assuming that shuttle layovers take place within the Kiss & Ride lot. Given that dwell times in the AM peak are very short, layover location only impacts the capacity of the Kiss & Ride during the PM peak, when 10 minutes of the 13:05 dwell time were attributed to layovers. For the options where no separate layover or "queuing" space is available for shuttle buses, it was assumed that all layover and dwell time would take place within the stops. For the options where a layover or "queuing" space was provided, it

<sup>1</sup> WMATA's August 2011 *Shuttle Services at Metro Facilities*.



was assumed that shuttle buses would line up in approximately 35-foot spaces and that all layover and dwell time would take place within the Kiss & Ride, in the designated shuttle stops and queuing areas. Where layovers were assumed to take place on-street, all layover time (10 minutes per shuttle during the PM peak) was removed from the calculations. Where queuing areas are shared by taxis, it was assumed that taxis would not use the space at times when shuttle buses need it (e.g., during the busiest part of the PM peak period). This presents a conflict, as taxi queuing was observed to be the greatest during the PM peak, at the same time as shuttle buses utilize the greatest amount of space.

**Table 2-1** estimates the maximum number of shuttle buses each Kiss & Ride configuration could accommodate per hour.

**Table 2-1: Typical Weekday Bus Activity at Van Dorn Street Metrorail Station Bus Bays**

Lot Configuration	Shuttle Stop Length	Shuttle Layover Location or Length of Queuing Area	Maximum Shuttle Buses per Hour: AM	Maximum Shuttle Buses per Hour: PM	Estimated Year Shuttle Capacity Exceeded: AM Peak	Estimated Year Shuttle Capacity Exceeded: PM Peak
Option 1-A	100 feet	In Stop	44	9	2028	Currently Exceeds
Option 1-A	100 feet	On Street	44	38	2028	2032
Option 2-A	100 feet	In Stop	44	9	2028	Currently Exceeds
Option 2-A	100 feet	On Street	44	38	2028	2032
Option 2-B	100 feet	90 feet	44	18	2028	Currently Exceeds
Option 2-B	100 feet	On Street	44	38	2028	2032
Option 3-A	135 feet	105 feet*	67	27	2041	2021
Option 3-A	135 feet	On Street	67	58	2041	2046
Option 3-B	135 feet	In Stop	67	13	2041	Currently Exceeds
Option 3-B	135 feet	On Street	67	58	2041	2046
Option 3-C	135 feet	In Stop	67	13	2041	Currently Exceeds
Option 3-C	135 feet	On Street	67	58	2041	2046
Option 4-A	165 feet	105 feet*	67	27	2041	2021
Option 4-A	165 feet	105 feet*	67	58	2041	2046

\*Mixed taxi/shuttle queue – these calculations preclude taxis from using the queue during the PM peak period

The above chart shows that for the AM peak period, for Options 1 and 2, the Kiss & Ride will reach its capacity for shuttle buses at approximately 44 shuttle buses per hour, which given current growth estimates will occur around 2028; for Options 3 and 4, the Kiss & Ride will reach its capacity for shuttle buses at approximately 67 shuttle buses per hour, which according to current growth estimates will occur around 2041.

The PM peak period is more constrained. Without use of the street for layovers, all options except 3-A

and 4-A would be unable to accommodate the existing volume of shuttle buses without the use of additional space (such as parking spaces not designated for shuttle buses) for shuttle layovers. Both options 3-A and 4-A would be able to accommodate up to 27 shuttle buses per hour, and would reach capacity in approximately 2021. If layovers can occur in an on-street area outside of the Kiss & Ride, and are not constrained, then Options 1 and 2 could accommodate up to 38 shuttle buses per hour, reaching capacity in approximately 2032, while Options 3 and 4 could accommodate up to 58 shuttle buses per hour, reaching capacity in approximately 2046. Again, all timeframes noted here are very rough estimates, and are dependent on a steady rate of growth in shuttle activity of approximately 2.2 percent per year.

The strategy of moving layovers to on-street locations maximizes the number of shuttle buses that can use the Kiss & Ride for pickups/drop-offs by eliminating the need to use the shuttle area for layovers. It also allows taxis to use all or part of the shared queuing area during the PM peak period, which is consequently also a time of day when taxis require a substantial amount of queuing space as well.

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# **Appendix C**

## **Detailed Conceptual Cost Estimates**

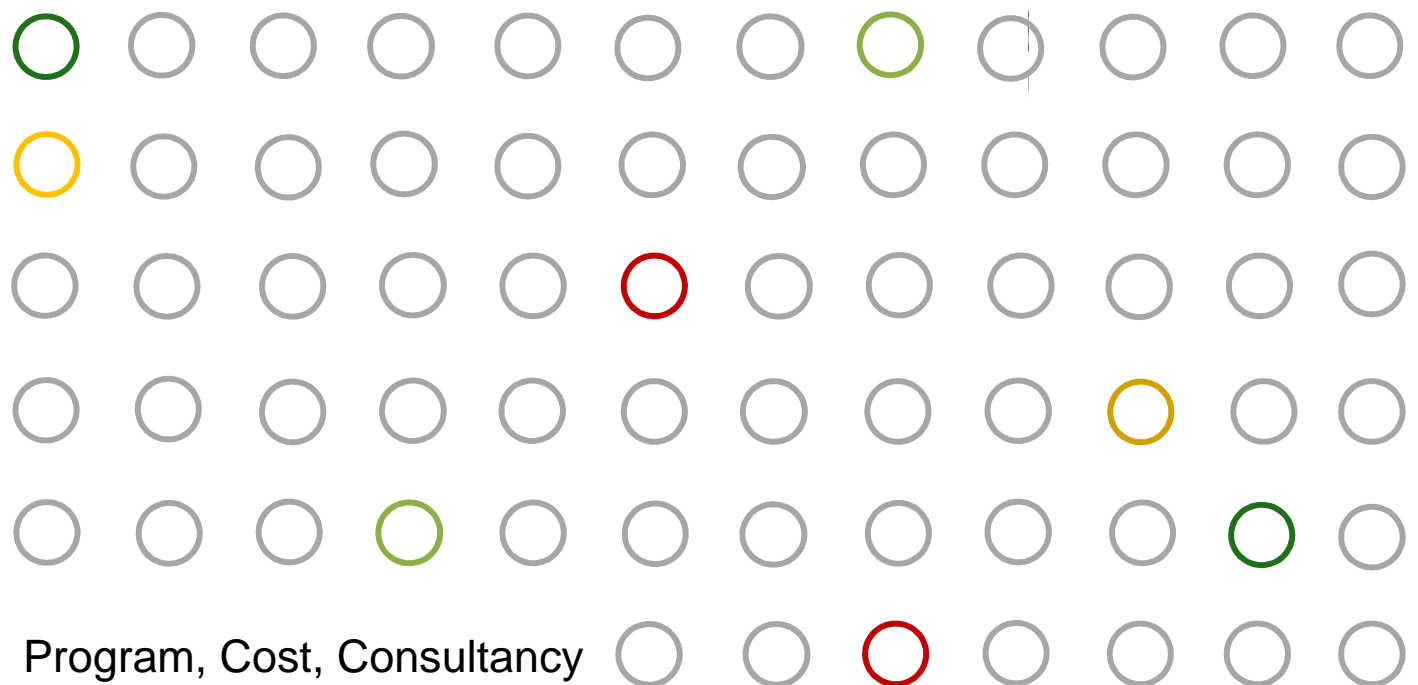
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# FEASIBILITY STUDY COST ESTIMATE

for

**Van Dorn St. Kiss & Ride  
WMATA**

October 2, 2013





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AECOM  
3101 Wilson Blvd  
Suite 900  
Arlington, VA 22202  
www.aecom.com

703.682.4900 tel  
703.682.4901 fax

October 2, 2013

Derek Crider  
**AECOM Transportation**  
2101 Wilson Blvd  
Suite 800  
Arlington, VA 22201

**Van Dorn St. Kiss & Ride - WMATA, Alexandria, VA**

Dear Derek:

Please find enclosed our ROM Cost Estimate for the above referenced project based on Conceptual Design information.

	<b>Const. Start</b>	<b>Estimated Cost</b>
Option 1	2Q2018	\$1,199,989
Option 2	2Q2018	\$1,214,376

This estimate includes all direct construction costs, general contractor's overhead and profit, contingency and bond & insurances. Cost escalation assumes start dates indicated above.

Bidding conditions are expected to reflect competitive bidding to pre-qualified general contractors, open bidding for sub-contractors, open specifications for materials and manufactures.

The estimate is based prevailing wage rates for construction in this market and represents a reasonable opinion of cost. It is not a prediction of the successful bid from a contractor as bids will vary due to fluctuating market conditions, errors and omissions, proprietary specifications, lack or surplus of bidders, perception of risk, etc. Consequently the estimate is expected to fall within the range of bids from a number of competitive contractors or subcontractors, however we do not warrant that bids or negotiated prices will not vary from the final construction cost estimate.

If you have any questions or require further analysis please do not hesitate to contact us.

Sincerely,

James Partridge  
Associate

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Option 1	5
Option 2	7

**BASIS OF COST ESTIMATE**

Cost Estimate Prepared From

Dated

Received

Drawings issued for

Conceptual alternative designs

09/18/12

Email briefs from architects and engineers

Conditions of Construction

The pricing is based on the following general conditions of construction

- A start date of April 2018
- A construction period of 8 months
- The general contract will be awarded to one General Contractor
- There will not be small business set aside requirements
- The contractor will be required to pay prevailing wage rates
- No Phasing is anticipated
- The general contractor will have full access to the site during normal business hours
- Compression of schedule, premium or shift work, and restrictions on the contractor's working hours - An allowance for 60% of Estimated Contract Award is labor; 25% of labor is premium time & is paid at time and a half is included with each line item (see detailed estimate)



## **INCLUSIONS**

The Van Dorn Station project, in Virginia involves the reconfiguration of the Kiss and Ride area which includes elimination of current island, additional sidewalks, new island and configured internal circulation.

### The Cost Plan is based on the following conditions:

The costs in this report covers construction costs only calculated at current bidding price level (reflecting the current projected construction schedule) with a separate allowance for cost escalation.

Cost escalation is included to the mid point of the construction schedule. Unit rates in the body of the report include appropriate escalation allowances to deliver specific trades within the prescribed schedule if the project were to commence today.

Cost associated with additional escalation required for future start date are included as a below the line markup. This report has included this additional escalation to the scheduled start date of construction noted in this report.

### Bidding Process - Market Conditions

This document is based on the measurement and pricing of quantities wherever information is provided and/or reasonable assumptions for other work not covered in the drawings or specifications, as stated within this document. Unit rates have been obtained from historical records and/or discussion with contractors. The unit rates reflect current bid costs in the area. All unit rates relevant to subcontractor work include the subcontractors overhead and profit unless otherwise stated. The mark-ups cover the costs of field overhead, home office overhead and profit and range from 10% to 20% of the cost for a particular item of work.

Pricing reflects probable construction costs obtainable in the project locality on the date of this statement of probable costs. This estimate is a determination of fair market value for the construction of this project. It is not a prediction of low bid. Pricing assumes competitive bidding for every portion of the construction work for all subcontractors and general contractors, with a minimum of 5 bidders for all items of work. Experience and research indicates that a fewer number of bidders may result in higher bids, conversely an increased number of bidders may result in more competitive bids.

AECOM has no control over the cost of labor, material, equipment, or over the contractor's method of determining prices, or over the competitive bidding or market conditions at the time of bid, the statement of probable construction cost is based on industry practice, professional experience and qualifications, and represents AECOM's best judgment as professional construction consultant familiar with the construction industry. However, AECOM cannot and does not guarantee that the proposals, bids, or the construction cost will not vary from opinions of probable cost prepared by them.

**EXCLUSIONS**

- Hazardous material handling, disposal and abatement
- Design, testing, inspection or construction management fees
- Assessments, taxes, finance, legal and development charges
- Environmental impact mitigation
- Builder's risk, project wrap-up and other owner provided insurance program
- Land and easement acquisition
- Cost escalation beyond mid point of construction 3Q2018

**OVERALL SUMMARY COMPARISON - ORDER OF MAGNITUDE COSTS**

Description		Option 1	Option 2
SITE PREPARATION		153,762	153,762
SITE IMPROVEMENTS		303,598	310,628
SITE MECHANICAL UTILITIES		75,000	75,000
SITE ELECTRICAL UTILITIES		54,000	54,000
* Assume 60% of Estimated Contract Award is labor; 25% of labor is premium time & is paid at time and a half		43,976.97	44,504.21
Phasing Requirements		assume not required	assume not required
SITE WORK COST		630,337	637,894
Contingency	20.0%	126,067	127,579
SITEWORK COST INCLUDING CONTIGENCIES		756,404	765,472
General Conditions and Project Requirements	18.0%	136,153	137,785
Bond & Insurance	2.0%	17,851	18,065
Permit	0.0%	assume by owner	assume by owner
Overhead & Profit	14.0%	124,958	126,456
SITEWORK COST BEFORE ESCALATION		1,035,366	1,047,779
Escalation - (assume mid-point of construction 3Q2014)	15.9%	164,623	166,597
RECOMMENDED BUDGET		1,199,989	1,214,376

	Quantity	Unit	Rate	Total
<b><u>Parking Lot - Option 1</u></b>				
SITE PREPARATION				
Site Clearance, general	1	LS	5,000.00	5,000
Trees removal and Protection				
Remove trees w/ stumps	10	EA	1,200.00	12,000
Tree protection	10	EA	350.00	3,500
Site Demolition and Relocation				
Remove light poles	5	EA	1,000.00	5,000
Remove bollards with parking meters	8	EA	150.00	1,200
Remove catch basin	3	EA	1,200.00	3,600
Mill Asphalt paving	5,556	SY	5.60	31,111
Demo, concrete pavement	6,087	SF	3.60	21,912
Demo curb	793	LF	6.00	4,758
Disposal of demo materials	285	CY	55.00	15,681
Site Earthwork				
Allowance for earthwork and surveying	1	LS	50,000.00	50,000
				<b>\$153,762</b>
SITE IMPROVEMENTS				
Drive ways and Parking Lots				
New Asphalt pavement on grade				
2" Bituminous concrete (SC), 3"BC. & 6" graded base course	550	SY	60.00	33,000
Lay over Asphalt pavement				
3" Bituminous concrete(SC)	5,556	SY	18.00	100,000
Curb				
Curb & gutter at perimeter of site	1,004	LF	20.00	17,140
Curb & gutter at perimeter of median	857	LF	20.00	20,080
Pedestrian Paving				
Sidewalk	3,400	SF	8.00	27,200
Sidewalk ramp	400	SF	15.00	6,000
Pavement Markings				
12" Thermoplastic marking (stop bar)	28	LF	12.00	336
4" Thermoplastic marking	1,210	LF	3.50	4,235
No-parking space marking	2,480	SF	2.50	6,200
Crosswalk markings (925sf)	925	SF	2.50	2,313
Arrow Signs	17	EA	250.00	4,250
Signage	10	EA	500.00	5,000
Handicap Signs stripping	3	EA	330.00	990
Layout of pavement marking	1	LS	3,000.00	3,000
Site Development				
Bus stop shelter	3	EA	12,000.00	36,000
Benches 6' length	3	EA	3,000.00	9,000
Receptacles	4	EA	800.00	3,200
Bike rack for 12 stations	1	EA	2,500.00	2,500



	Quantity	Unit	Rate	Total
<b><u>Parking Lot - Option 1</u></b>				
Landscaping				
Top soil	159	CY	35.00	5,574
Trees	7	EA	1,500.00	10,500
Grass	4,720	SF	1.50	7,080
				<b>\$303,598</b>
<b>SITE MECHANICAL UTILITIES</b>				
Allowance for storm water management system	1	LS	75,000.00	75,000.00
				<b>\$75,000</b>
<b>SITE ELECTRICAL UTILITIES</b>				
12' Light poles	10	EA	2,800.00	28,000
Pole base	10	EA	500.00	5,000
Circuitry	1,500	LF	14.00	21,000
				<b>\$54,000</b>

	Quantity	Unit	Rate	Total
<b><u>Parking Lot - Option 2</u></b>				
SITE PREPARATION				
Site Clearance, general	1	LS	5,000.00	5,000
Trees removal and Protection				
Remove trees w/ stumps	10	EA	1,200.00	12,000
Tree protection	10	EA	350.00	3,500
Site Demolition and Relocation				
Remove light poles	5	EA	1,000.00	5,000
Remove bollards with parking meters	8	EA	150.00	1,200
Remove catch basin	3	EA	1,200.00	3,600
Mill Asphalt paving	5,556	SY	5.60	31,111
Demo, concrete pavement	6,087	SF	3.60	21,912
Demo curb	793	LF	6.00	4,758
Disposal of demo materials	285	CY	55.00	15,681
Site Earthwork				
Allowance for earthwork and surveying	1	LS	50,000.00	50,000
				<b>\$153,762</b>
SITE IMPROVEMENTS				
Drive ways and Parking Lots				
New Asphalt pavement on grade				
2" Bituminous concrete (SC), 3"BC. & 6" graded base course	550	SY	60.00	33,000
Lay over Asphalt pavement				
3" Bituminous concrete(SC)	5,556	SY	18.00	100,000
Curb				
Curb & gutter at perimeter of site	1,004	LF	20.00	23,000
Curb & gutter at perimeter of median	1,150	LF	20.00	20,080
Pedestrian Paving				
Sidewalk	3,400	SF	8.00	27,200
Sidewalk ramp	400	SF	15.00	6,000
Pavement Markings				
12" Thermoplastic marking (stop bar)	28	LF	12.00	336
4" Thermoplastic marking	1,210	LF	3.50	4,235
No-parking space marking	1,990	SF	2.50	4,975
Crosswalk markings (925sf)	925	SF	2.50	2,313
Arrow Signs	17	EA	250.00	4,250
Signage	10	EA	500.00	5,000
Handicap Signs stripping	3	EA	330.00	990
Layout of pavement marking	1	LS	3,000.00	3,000
Site Development				
Bus stop shelter	3	EA	12,000.00	36,000
Benches 6' length	3	EA	3,000.00	9,000
Receptacles	4	EA	800.00	3,200
Bike rack for 12 stations	1	EA	2,500.00	2,500

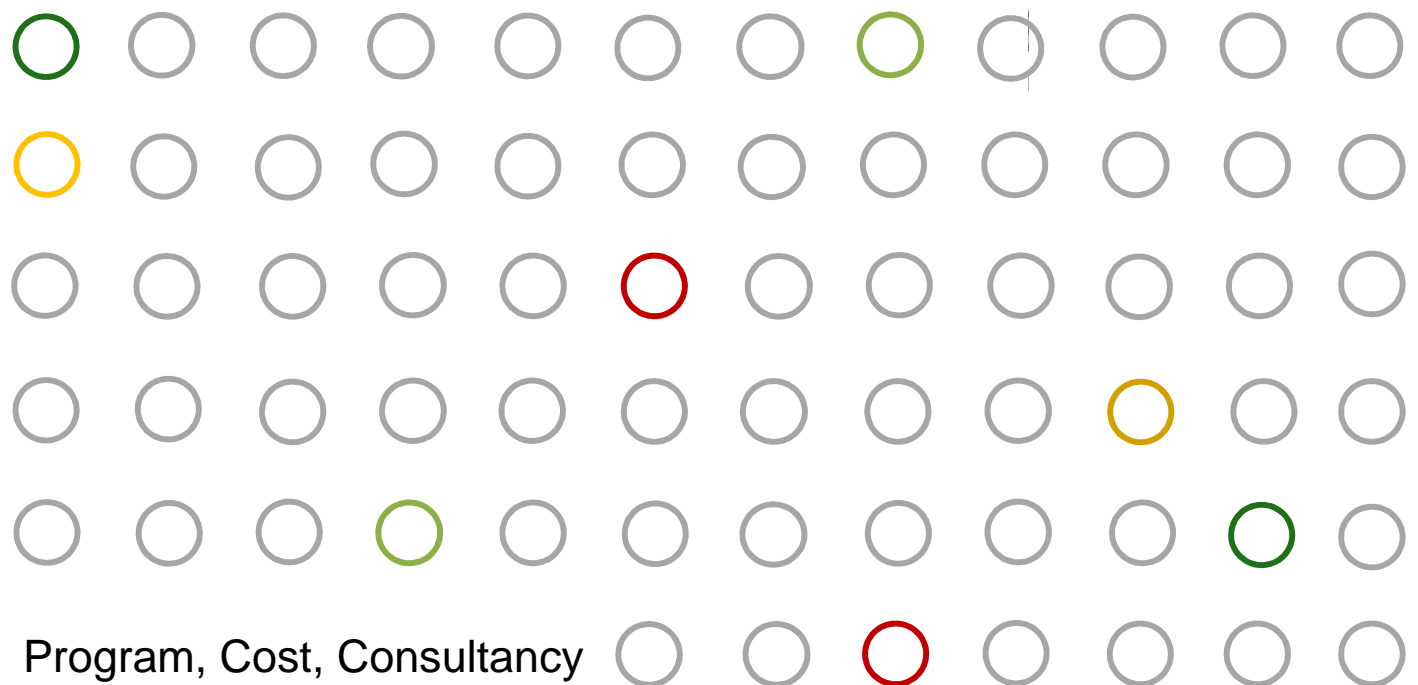
	Quantity	Unit	Rate	Total
<b><u>Parking Lot - Option 2</u></b>				
Landscaping				
Top soil	176	CY	35.00	6,160
Trees	7	EA	1,500.00	10,500
Grass	5,926	SF	1.50	8,889
				<b>\$310,628</b>
SITE MECHANICAL UTILITIES				
Allowance for storm water management system	1	LS	75,000.00	75,000.00
				<b>\$75,000</b>
SITE ELECTRICAL UTILITIES				
12' Light poles	10	EA	2,800.00	28,000
Pole base	10	EA	500.00	5,000
Circuitry	1,500	LF	14.00	21,000
				<b>\$54,000</b>

# FEASIBILITY STUDY COST ESTIMATE

for

**Van Dorn St. Bus Loop**  
**WMATA**

October 2, 2013





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AECOM  
3101 Wilson Blvd  
Suite 900  
Arlington, VA 22202  
www.aecom.com

703.682.4900 tel  
703.682.4901 fax

October 2, 2013

Derek Crider  
**AECOM Transportation**  
2101 Wilson Blvd  
Suite 800  
Arlington, VA 22201

**Van Dorn St. Bus Loop - WMATA, Alexandria, VA**

Dear Derek:

Please find enclosed our ROM Cost Estimate for the above referenced project based on Conceptual Design information.

	<b>Const. Start</b>	<b>Estimated Cost</b>
Detail Estimate	2Q2018	\$409,302

This estimate includes all direct construction costs, general contractor's overhead and profit, contingency and bond & insurances. Cost escalation assumes start dates indicated above.

Bidding conditions are expected to reflect competitive bidding to pre-qualified general contractors, open bidding for sub-contractors, open specifications for materials and manufactures.

The estimate is based on prevailing wage rates for construction in this market and represents a reasonable opinion of cost. It is not a prediction of the successful bid from a contractor as bids will vary due to fluctuating market conditions, errors and omissions, proprietary specifications, lack or surplus of bidders, perception of risk, etc. Consequently the estimate is expected to fall within the range of bids from a number of competitive contractors or subcontractors, however we do not warrant that bids or negotiated prices will not vary from the final construction cost estimate.

If you have any questions or require further analysis please do not hesitate to contact us.

Sincerely,

James Partridge  
Associate

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Inclusions	2
Exclusions	3
Overall Summary	4
Detail Estimate	5

**BASIS OF COST ESTIMATE**

Cost Estimate Prepared From

Dated

Received

Drawings issued for

Conceptual design

09/25/13

Email briefs from architects and engineers

Conditions of Construction

The pricing is based on the following general conditions of construction

- A start date of April 2018
- A construction period of 4 months
- The general contract will be awarded to one General Contractor
- There will not be small business set aside requirements
- The contractor will be required to pay prevailing wage rates
- No Phasing is anticipated
- The general contractor will have full access to the site during normal business hours
- Compression of schedule, premium or shift work, and restrictions on the contractor's working hours - An allowance for 60% of Estimated Contract Award is labor; 25% of labor is premium time & is paid at time and a half is included with each line item (see detailed estimate)



## **INCLUSIONS**

The Van Dorn Station Bus Loop project, in Virginia involves an additional new bus bay, and the widening of sidewalks along Eisenhower Ave adjacent to the bus loop area.

### The Cost Plan is based on the following conditions:

The costs in this report covers construction costs only calculated at current bidding price level (reflecting the current projected construction schedule) with a separate allowance for cost escalation.

Cost escalation is included to the mid point of the construction schedule. Unit rates in the body of the report include appropriate escalation allowances to deliver specific trades within the prescribed schedule if the project were to commence today.

Cost associated with additional escalation required for future start date are included as a below the line markup. This report has included this additional escalation to the scheduled start date of construction noted in this report.

### Bidding Process - Market Conditions

This document is based on the measurement and pricing of quantities wherever information is provided and/or reasonable assumptions for other work not covered in the drawings or specifications, as stated within this document. Unit rates have been obtained from historical records and/or discussion with contractors. The unit rates reflect current bid costs in the area. All unit rates relevant to subcontractor work include the subcontractors overhead and profit unless otherwise stated. The mark-ups cover the costs of field overhead, home office overhead and profit and range from 10% to 20% of the cost for a particular item of work.

Pricing reflects probable construction costs obtainable in the project locality on the date of this statement of probable costs. This estimate is a determination of fair market value for the construction of this project. It is not a prediction of low bid. Pricing assumes competitive bidding for every portion of the construction work for all subcontractors and general contractors, with a minimum of 5 bidders for all items of work. Experience and research indicates that a fewer number of bidders may result in higher bids, conversely an increased number of bidders may result in more competitive bids.

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- Hazardous material handling, disposal and abatement
- Design, testing, inspection or construction management fees
- Assessments, taxes, finance, legal and development charges
- Environmental impact mitigation
- Builder's risk, project wrap-up and other owner provided insurance program
- Land and easement acquisition
- Cost escalation beyond mid point of construction 3Q2018

**OVERALL SUMMARY COMPARISON - ORDER OF MAGNITUDE COSTS**

Description		Detail Estimate
SITE PREPARATION		44,220
SITE IMPROVEMENTS		97,967
SITE MECHANICAL UTILITIES		30,000
SITE ELECTRICAL UTILITIES		15,000
* Assume 60% of Estimated Contract Award is labor; 25% of labor is premium time & is paid at time and a half		14,039.00
Phasing Requirements		assume not required
SITE WORK COST		201,226
Contingency	20.0%	40,245
SITEWORK COST INCLUDING CONTIGENCIES		241,471
General Conditions and Project Requirements	25.0%	60,368
Bond & Insurance	2.0%	6,037
Permit	0.0%	assume by owner
Overhead & Profit	15.0%	45,276
SITEWORK COST BEFORE ESCALATION		353,151
Escalation - (assume mid-point of construction 3Q2018)	15.9%	56,151
RECOMMENDED BUDGET		409,302
Sidewalk along Eisenhower Ave (Included in base estimate)		
Demo existing sidewalk (includes markup)		12,505
New sidewalk (includes markup)		61,751
TOTAL COST - Sidewalk Along Eisenhower Ave		74,256

	Quantity	Unit	Rate	Total
<b><u>Bus Loop</u></b>				
SITE PREPARATION				
Site Clearance, general	1	LS	3,000.00	3,000
Trees removal and Protection				
Remove trees w/ stumps	4	EA	1,200.00	4,800
Tree protection	3	EA	350.00	1,050
Site Demolition and Relocation				
Demo, concrete pavement	1,575	SF	3.60	5,670
Demo curb	150	LF	6.00	900
Disposal of demo materials	160	CY	55.00	8,800
Site Earthwork				
Allowance for earthwork and surveying	1	LS	20,000.00	20,000
				<b>\$44,220</b>
SITE IMPROVEMENTS				
Drive ways and Parking Lots				
New Asphalt pavement on grade				
2" Bituminous concrete (SC), 3"BC. & 6" graded base course	578	SY	60.00	34,667
Curb				
Curb & gutter @ new bay	150	LF	20.00	7,000
Curb & gutter at perimeter of sidewalk	350	LF	20.00	3,000
Pedestrian Paving				
Side walk	3,500	SF	8.00	28,000
Sidewalk ramp	400	SF	15.00	6,000
Pavement Markings				
Allow for signage and pavement marking	1	LS	10,000.00	10,000
Site Development				
Benches 6' length	2	EA	3,000.00	6,000
Receptacles	1	EA	800.00	800
Landscape - allow	1	LS	2,500.00	2,500
				<b>\$97,967</b>
SITE MECHANICAL UTILITIES				
Allowance for storm water management system	1	LS	30,000.00	30,000.00
				<b>\$30,000</b>
SITE ELECTRICAL UTILITIES				
12' Light poles	2	EA	2,800.00	5,600
Pole base	2	EA	500.00	1,000
Circuitry	600	LF	14.00	8,400
				<b>\$15,000</b>